BIOLOGICAL ASSESSMENT FOR THE PROPOSED GREAT NORTHERN MOUNTAIN SKI DEVELOPMENT

Biologist Conducting Assessment: Michael J. Madel
Wildlife Biologist

Libby Ranger District
Kootenai National Forest

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PREFACE

In the spring of 1982, the Kootenai National Forest conducted a scoping analysis for the proposed Great Northern Ski Area E.I.S. The potential jeopardy of the grizzly bear was a key issue that could effect the development of this project.

It was mutually agreed upon by the Kootenai National Forest and the Great Northern Ski Corporation to prepare this biological Assessment prior to any further studies to determine if there is a window of opportunity which would potentially allow development of this proposal. This assessment is based on the corporations proposal as submitted for a special use permit. It does not consider alternative development levels, alternative locations, or the environmental, social, and economic affects of the proposed compensation measures.

The consultation on this project will establish the initial feasibility only for this single issue (the effect on grizzly bear). It is planned to proceed immediately into the preparation of an E.I.S. if a development opportunity exists without jeopardy to the grizzly bear. As the E.I.S. analysis is developed, further discussion on alternatives considered and compensation proposed will be needed. A major change from this initial proposal would require further consultation.

It is our desire to initially determine if their is any feasibility of this project within the Cabinet Mountain Grizzly Bear Ecosystem and a range of compensation measures that could be applied. This issue and its consequences would then become a key part of the decision to be made in the Environmental Impact Statement.

W.E. Morden

WILLIAM E. MORDEN
Forest Supervisor
Kootenai National Forest

I. INTRODUCTION

This assessment analyzes the potential effects of the proposed Great Northern Mountain Ski Area development on threatened or endangered species. Its purpose is to determine if the proposed project may effect Federally listed species in compliance with Section 7(c) of the Endangered Species Act of 1973 as amended. The U.S. Fish and Wildlife Service (USFWS Notice Review, April 2, 1982) has recognized three listed species that may be present in the analysis area; the peregrine falcon (Falco peregrinus anatum), Northern bald eagle (Haliacetus leucocephalus), and grizzly bear (Ursus arctos horribilis). Peregrine falcons and bald eagles are considered migrants along the Cabinet Mountain range, and to date no observations have been made nor evidence located of either raptor species nesting or wintering within the project area. Delineated essential bald eagle habitat lies several miles north, surrounding open-water riparian habitat of the Kootenai River system (Craighead and Craighead 1979). Migrating eagles have been seen perched and foraging along the mid to lower stretches of Libby Creek in the fall months during mountain whitefish spawning runs (Bratkovich 1983 pers. comm.), but it is not felt that the proposed project in upper Libby Creek would affect, in any way, eagles using the lower segments of Libby Creek. The grizzly bear is the only listed species known to occur in the analysis area, and consequently, this biological assessment will be addressed to the grizzly and its habitat.

Information on the basic biology and ecological requirements of grizzly bears in northwestern Montana have been summarized by Gale (1979) and will not be repeated in this report. Madel (1982) and Moore and Gilbert (1977) have identified and described important grizzly habitat characteristics in the Cabinet Mountains of the Cabinet-Yaak Ecosystem (CYE).

II. PROPOSED PROJECT

A. Location

The proposed ski development is located in south-central Lincoln County, Montana, 20 miles south of Libby on the east face of the main Cabinet Mountain range (page 3). The Cabinet Mountains extend along several major north-south structural faults between the Clark Fork River and the Kootenai River to the north. The area is characterized by steep rugged peaks and narrow U-shaped valleys created by past alpine and Cordilleran glaciation. Elevation ranges between 2000 feet along the Kootenai River and 8738 feet atop Snowshoe Peak. Pacific maritime weather patterns strongly influence the Cabinet Range, receiving up to 110 inches of annual precipitation at higher altitudes, much of this accumulating as snow. The valley bottoms and low to mid slopes are heavily forested with stands of mixed conifers.

The project area is centered on Great Northern Mountain (GNM), a broad eastern extension of the Twin Peaks-Cabinet Divide ridge that

separates the upper Libby Creek and West Fisher drainages (See Map 1). A prominent saddle is situated between GNM and the Miller Creek drainage to the east, with 35 acre Howard Lake close to the low point of the saddle. Topography is characterized by deep valleys, steep timbered slopes, and high rugged cirque basins. Dense forest stands dominated by western hemlock and western red cedar typically occur along drainage bottoms and lower slopes with grand fir, larch, spruce, and white pine intermixed in low to mid elevation timber. Subalpine fir is the main composite of the subalpine zone with whitebark pine and alpine larch along more xeric ridges. Common forest habitat types are designated by common acronyms and include: TSHE/CLUN, THPL/CLUN, ABGR/LIBO, ABLA/CLUN, ABLA/MEFE, ABLA/XETE, ABLA/LUHI, and PIAL/ABLA (Phister et al. 1977). Non forested topoedaphic and seral vegetation communities such as riparian stream bottoms, wet meadows, sidehill parks, and a variety of shrubfields occur at all elevations, forming a diverse vegetative mosaic over the landscape.

B. Project Description

The proposed downhill ski slopes and base area encompass approximately 1400 acres of National Forest land on the broad northeast face of GNM. The general operating scenerio planned by the investors (Great Northern Ski Corporation) for the ski area and adjacent private lands define a two season mountain resort, the winter ski season running from the end of November to April 15, and the summer season between June 15 and September 15. The ski hill is projected to accomodate between 4000 and 6000 skiers per day, with an estimated 285,000-515,000 skier visits per year. Nine ski lifts and several runs have been located at various elevations on the slope as shown on the preliminary mountain plan (See Map 2).

A high density residential area planned at the base of the mountain (near ski lifts D,C and B) would include a mixture of hotels, condominiums, and small lodges which in total would provide an estimated bed capacity of 1200 to 1500. The base area would support a full service commercial village with a shopping mall, restaurants, and various apres-ski activities. Outdoor heated swimming pools, indoor ice skating rinks, indoor-outdoor tennis courts, and convention facilities are proposed within the base vicinity to assist in attracting participants, other than skiers, during the winter and in promoting summer visitation. A day lodge at the bottom of ski lifts G-F, and a mountain restaurant located near the top of lifts I and H are planned west of the base center. A separate village development of smaller scale will be located along the south side of Libby Creek (SW Section 11, T27N, R31W) at the mouth of the canyon (See Map 2). This would operate primarily as a nordic ski center with a main lodge, accommodating approximately 50 to 100 people per week (±50 beds), eating facilities, lounge, and a shop. There have been no projections made for the number of summer visitors or total occupancy at the resort complex during the summer.

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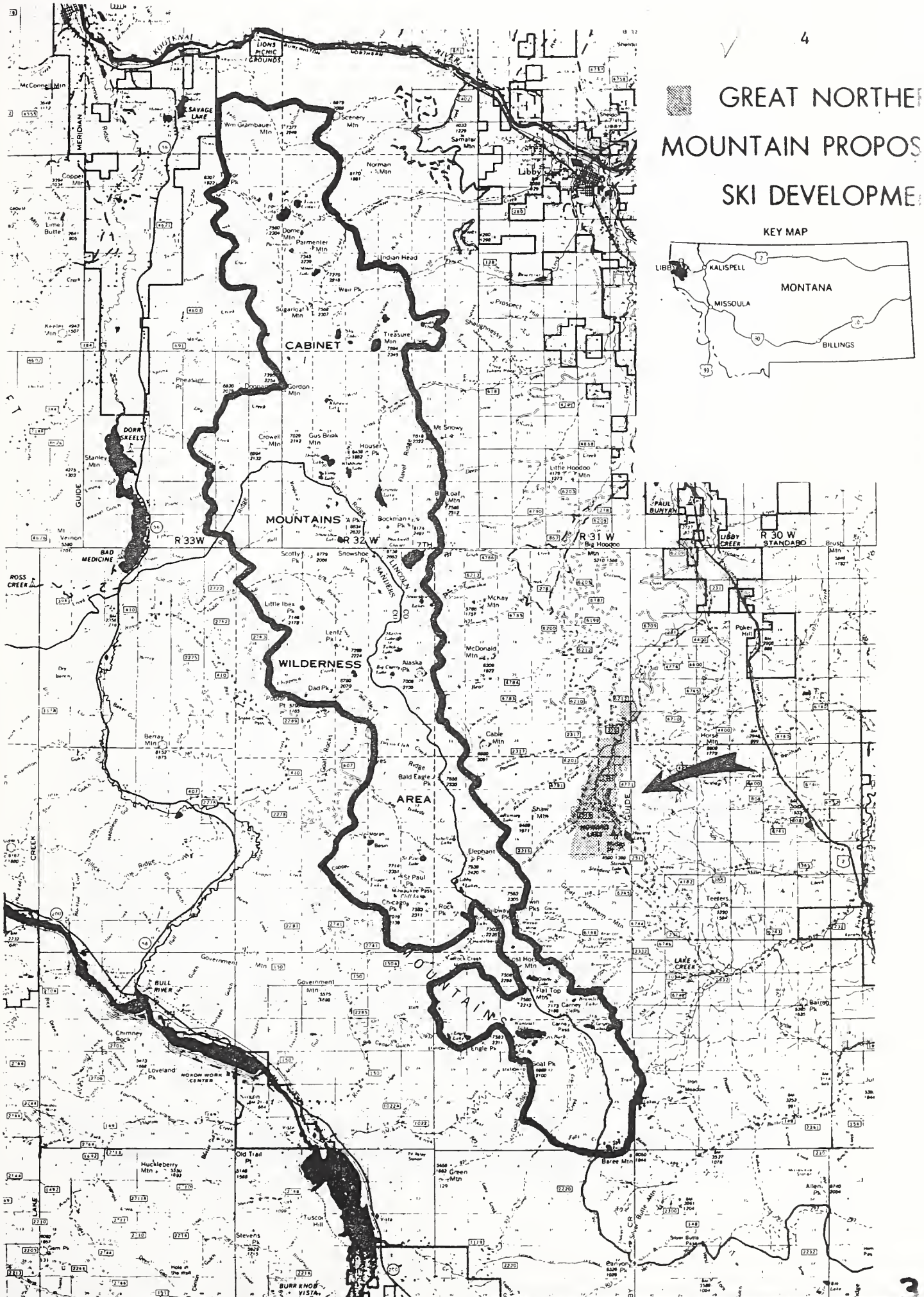

Electrical power for the entire development is proposed to be generated on site by diesel fueled generators. If power generation is unfeasible, powerline corridors would likely run along the most direct existing road corridor, that being FS Road 231. Primary vehicle access to GNM from Highway 2 is proposed to use existing Libby Creek Road (FS 231) which ascends the lower slopes of Libby Creek canyon 11.0 miles to the base of the mountain. An upgrading of FS 231 would be necessary to handle the increased year-around traffic, and would entail widening portions of the road and improving its surface to an oiled hard-pack or pavement. The West Fisher Creek Road (FS 231) from Highway 2 (the south half of the Libby-West Fisher Creek 231 loop) is considered as an alternative access corridor.

Corporate investors plan to develop surrounding lands for residential lots and/or condominium use. Presently, the majority of private land, both under corporate and non-corporate ownership, is located along Libby Creek as a long linear block containing a total of 1450 acres (See Map 1A). Other factors that have not been included in the preliminary proposal for the mountain and base properties but can be assumed to occur directly or indirectly with resort development and future growth are discussed in the project analysis section.

C. Related Offsite Recreation Activities

Associated with a destination ski resort are other new recreational activities or existing uses that would increase from current levels (Jackson Hole EA 1980, Mount Hebgen EIS 1977, pers. comm. A. Silker, G. Morris, J. Korb 1983). Because of the many semi-primitive and wilderness amenities close to GNM, offsite recreational activities can be expected to increase substantially as the project area changes from an undeveloped forest environment to a more urbanized setting.

The majority of these activities are classified as dispersed recreation and tend to vary seasonally in their levels of use. Table 1 (Appendix I) displays potential and current activities likely to occur as spinoff effects from the proposed resort center. Potential activities and use patterns have been selected from a history of recreational uses occurring at existing destination ski resorts in western states with conditions comparable to the Cabinet Mountain environment (discussed under Project Analysis; Comparative analysis of destination ski areas, p 14). Trails and roads that access primary attractions such as lake basins or scenic viewpoints presently receive a large percentage of total current use in the Cabinet Wilderness (Cabinet Mountain Wilderness Report 1978-1982) and surrounding roaded areas. These routes would likely receive increased use proportionate to the visiting and residential population associated with the proposed development.

III. GRIZZLY BEAR HABITAT

The proposed project area lies within occupied grizzly bear habitat as delineated by the Kootenai National Forest (KNF) Grizzly Management Situations Map for the Cabinet-Yaak Ecosystem (See Map 1C). Libby

Creek, Great Northern Mountain (GNM), and West Fisher drainage together provide yearlong habitat needs for grizzlies that overlap this area as part of their home ranges. Cabinet Mountain grizzlies are seasonal altitudinal migrants, moving from low elevation sites early in the spring to upper elevations in the summer and fall months in response to the availability of key bear foods. Bears are opportunistic in their food habits, selecting the more nutritious foods temporally and spatially available (Craighead 1982). High energy plant foods constitute a large portion of their omnivorous diet and tend to occur in four main food categories: (1) graminoids (2) wet-site forbs (3) roots-corms (4) fruits. Preferred plant foods typically grow in abundance in open nonforested habitat components. Descriptions of habitat components, their relative value, and seasonal importance to grizzlies in the Cabinet Mountains are discussed in KNF Grizzly Bear Habitat Delineation Report (Madel 1982).

A. Constituent Elements

Habitat constituent elements consist of an arrangement of habitat component combinations that in total contain all physiological, behavioral, and ecological factors essential for the maintenance of a grizzly population (USFS 1983). Spring, summer, and autumn seasonal ranges and areas suitable for denning are therefore interpreted as constituent elements of grizzly bear habitat. Important foraging sites that supply nutritious plant foods during the spring season (den emergence - June 30) are those habitat components that green-up earliest at low elevations and on warm southern exposures. Within the analysis area graminoid sidehill parks located on south facing mid-elevation slopes near the mouths of the West Fisher, Libby, and Miller Creek canyons are among the first sites in the spring to provide bears with emerging perennial grasses and sedges. Riparian stream bottoms and marsh pockets along Libby, Standard, and West Fisher Creeks supply a high diversity of key bear foods, security cover, and densely vegetated bedding sites. Funneling cold air temperatures phenologically retard low gradient riparian zones occuring within the narrow upper canyons until mid June, thus dictating more importance to productive stream bottom sites outside the climatic influence of the canyons during early-mid spring months (April-May). Later in the spring the toe-ends of south facing mixed shrubfield/snowchutes supply an extensive source of umbel-forb and root-corm base.

Summer and fall ranges are of a more dispersed nature in the upper Libby and West Fisher drainages, and the upper slopes and basins of GNM. Mesic habitat components, including subalpine wet meadows, drainage forbfields, snowchutes, and alder shrubfields localized in high elevation cirque basins and on benches are important mid-season foraging areas (July 1-Aug 15). Succulent forbs and graminoids growing on these productive sites are fed on extensively by grizzlies prior to the availability of fruit. Roots-corms and sources of animal protein from ants (Formicidae) and rodents are commonly abundant in graminoid sidehill parks near ridgetops and shrubfield/snowchutes.

With the onset of shrub fruitification in late summer and early autumn, bears switch foraging patterns and rely heavily on huckleberry (Vaccinium spp) and mountain ash (Sorbus scopulina) fruit in shrubfield components. Open and timbered shrubfields commonly occur on mid to high elevation southerly slopes and cirque basins. Timbered shrubfields are difficult to visually locate and delineate in the field and thus are conservatively delineated on the habitat component map. The upper slopes of GNM have a well developed huckleberry shrub stratum and is one of the more concentrated fruit producing areas in the Cabinet range (pers. observation). The berries of mountain ash occur as a persistent fruit on through late autumn and are abundant in mixed shrubfield/snowchutes throughout the Libby and West Fisher canyons. Riparian stream bottom habitat provides a continued source of graminoids, wet-site forbs, and various fruit types later in the fall when main sources of fruit are less available or the highly variable huckleberry crops are poor.

Preferred grizzly denning habitat in the Cabinet-Yaak is yet to be statistically verified. Habitat components delineated as potential denning sites are generally inferred as such from research data collected from the Northern Continental Divide Ecosystem (NCDE) (Servheen 1981, Gillespie and Jonkel 1980, and Werner et al. 1978). A single grizzly den located in Bear Creek, 5 miles to the north of GNM, does verify the use by grizzlies of beargrass sidehill park habitat in which to excavate dens. Upper elevation huckleberry shrubfields and timbered shrubfields are also identified potential denning areas (±5500 feet and above). Such sites provide well developed soils for excavations, adequate snow accumulations, and isolation. Important denning habitat adjacent to the proposed project area occurs along the upper slopes and cirques of GNM, Libby Creek Canyon, and West Fisher-Ozette Lake drainage.

B. Observations and Habitat Use Patterns

Grizzly bear observation and sign locations within the East Cabinet Range are displayed seasonally on Map 1B (provided only for USDWS). Twenty nine reliable locations have been reported within the Libby and West Fisher over the last 24 years with twenty four (85%) made in the last 10 years (all locations displayed on the map have a reliability index rating of 4 to 5, from a rating scale of 1 to 5; 5 being highly reliable; Zager 1981). Two grizzly locations have been reported directly within the project area, one in June 1980 near the mouth of Libby Creek canyon, and the other, an observation in May 1978 at 6200 feet on GNM.

The seasonal clumping of grizzly observation/sign locations visually assists in identifying key foraging areas. By overlaying the locations onto the habitat component map, certain component types appear to be utilized most frequently, and to have considerable seasonal value to bears. Four recent female/young grizzly observations concentrated on the south facing slope of GNM-West Fisher canyon strongly suggest the importance of specific graminoid sidehill park habitats early in the spring. Riparian stream bottom and lower snowchute habitat in Libby Creek is also apparently used by grizzlies

during the late spring and early summer as identified by 6 sign and 1 observation locations. Autumn locations are typically made in or near huckleberry dominated shrubfields. Six grizzly locations in the upper West Fisher basin, and five definite observations in the small Ozette Lake basin display the importance of isolated high elevation shrubfield habitat.

From extensive field surveillance in the Cabinet Mountains, its been observed that black bears (Ursus americanus) nutritionally rely on three of the four main plant groups that constitute the grizzlies diet (pers. obs.). Because of this and the fact that black bears utilize similar high elevation habitats, it can be assumed that important foraging areas identified by numerous black bear observations are equally as important to grizzly bears (K. Kendall 1983 pers. comm., C. Jonkel 1983 pers. comm.). From aerial surveys in September 1982, it was visually determined that GNM had one of the highest black bear densities in the Cabinet Range (±1 bear/mi.^{2}; Survey Notes - Christenson 1982). Bears foraging in huckleberry shrubfields at this time demonstrate the importance of traditional food concentration sites.

The grizzly observation/sign locations map for the main Cabinet Range does display two general, but possibly significant habitat use patterns. The randomly reported locations suggest that there are two main grizzly activity centers, one encompassing the central portion of the East Cabinets from Granite Creek south to Bear Creek and Chippewa Creek. The second activity center is located in the southern end of the Cabinets from Ramsey Creek - Rock Creek down to Lake Creek and Swamp Creek (Clark Fork drainage).

In analyzing these visually relevant activity centers in comparison with specific habitat parameters of each bear location, a strong inference between habitat diversity (richness) and isolation in regard to grizzly habitat use can be made. Preference by grizzlies for diverse and productive high elevation cirque basins secluded from human intrusion during the summer and autumn seasons can be demonstrated by equating those basins that are used by grizzlies with isolated basins that are less diverse (quantified as seasonal habitat units for each drainage by Christensen and Madel 1982), and diverse - productive basins that are accessible by trails and have moderate to high levels of human use (100 visitors/summer or more; Cabinet Mountain Wilderness Report 1982). Spring grizzly locations indicate that spring range is apparently restricted to low elevation sidehill parks, riparian drainage bottoms, and avalanche chutes. Because of the limited nature of spring range, grizzlies must utilize sites that are much closer in proximity to open roads and human activities to meet their nutritional requirements.

C. Management Situations and Cummulative Effects

Occupied grizzly habitat for the entire Cabinet Range has been stratified and mapped into KNF Management Situations that incorporate habitat suitability with management guidelines (KNF Habitat Management Guidelines 1980). These situations and guidelines closely follow the

"Yellowstone Guidelines" in concept. Map 1C displays how the management situations are delineated for the analysis area. Briefly, situation 1 encompasses GNM and the Libby - West Fisher Creek Canyons providing grizzlies with yearlong habitat needs. Situation 3 contains high value seasonal ranges on which bears depend. Spring range is the critical constituent element in this case and covers the low gradient stretches of Libby Creek, Standard - West Fisher Creeks, Miller Creek; and the adjacent graminoid parks of Miller Creek - Teeter's Peak and Horse Mountain ridge complex. Howard Lake and the adjacent portion of the Miller Creek ridge are designated as situation 4 which functions as a travel corridor zone connecting other important seasonal habitat. The KNF Habitat Management Guidelines provide specific management direction and support for district-level projects and activities, and have been blended into the Integrated Forest Plan towards developing land management units that will maintain or improve grizzly habitat in the CYE.

The cumulative effects analysis process developed by the KNF for assessing impacts on grizzly bear habitat in the Cabinet Mountains designates eight "bear units", which individually represent a viable home range of an adult female grizzly (Christensen and Madel 1982). The GNM analysis area centers on the boundary of bear units 5 and 6, spatially overlapping to a certain extent in both units,as shown on Map 1A. The direct and indirect effects of the proposed project within these two relatively fixed bear units are analyzed in time and space as described in Section VI of this assessement.

IV. CURRENT ACTIVITIES SITUATION

A. Timber Harvest

Under current KNF direction roughly half of the analysis area is allocated for timber management under a sustained yield multiple resource concept (Hoodoo and Upper Fisher Land Management Plans, USDA 1979). The 5 year Libby District Timber Plan identifies three large timber sales scheduled within the analysis area (See Map 1D). The Horse-Cable Timber Sale (23 MMBF) is sold and scheduled for initial harvest in the summer of 1983 and occupies two separate watersheds, Libby Creek and Miller Creek. Both portions of this sale may be active until 1988. Midas Touch, a 3.5 MMBF sale is scheduled to sell in 1988 and will be confined primarily to the Midas Creek drainage, 1 mile east of the noncorporate private land of Libby Creek. The Trail Creek T.S. is planned to be sold in 1983. The Trail Creek Sale will be active through 1986, the Midas Touch Timber Sale until 1992.

Adjacent ongoing and future timber sales that may be of importance in this analysis are listed in Table 2 (Appendix I) and their locations displayed on Map 1D. Considerable annual overlap between sales is shown in Figures 1 and 2, but seasonal restrictions on logging activity in spring grizzly habitat substantially reduces the potential for temporal disturbance.

Past logging activities in the analysis area have had both negative and positive effects on grizzly habitat. Many of the relatively recent cutting units (within the last 16 years) are large in size and were heavily scarified, and presently provide few bear foods or effective hiding cover (Benedict and Kuennen 1980). Of more significance than direct habitat modifications over time was road development and the continued increase in human access to previously undisturbed segments of habitat. Older units that had been selectively logged in riparian zones, such as at the mouth of Libby Canyon and in Miller Creek, resulted in dense and productive forb/shrub stratum high in key bear foods. Clearcut units that were logged in the mid to late 1960's and broadcast burned also responded well in mixed shrubfield growth with a moderate huckleberry and service berry (Amelanchier alnifolia) component. Unfortunately, the benefits gained from an increase in foraging habitat and bear foods diversity are seriously reduced because of long term effects of open adjacent roads and related human disturbances (Schallenberger and Jonkel 1980, Zager 1980, and Aune and Stivers 1983).

B. Mining

The southern portion of the East Cabinets has incurred significant grizzly habitat loss and indirect mortality impacts from past prospecting and mining activities since the late 1800's (Montana Fish, Wildlife and Parks; Records to date). Roads constructed for several large mines previously operated in upper West Fisher, Bramlet, and Libby Creek drainages provide access to the drainage heads. After these mineral deposits were exhausted in the early to mid 1900's, the majority of these roads remained open to public use or private claim holders until present, and have possibly had a serious impact on the grizzly population over time.

In recent years there has been a significant increase in the number of hardrock mineral claims and oil/gas leases within and adjacent to the analysis area (J. Jeresek 1983 pers. comm.). Approximately 498 mining claims and 10 leases are presently documented in BLM records, essentially covering the entire land surface of the analysis area. A number of small mining operators are currently active during the snow-free seasons in each of the Cabinet drainages (See Map 1D). The type, level, and duration of mining activities in the analysis area are summarized in Table 3, Appendix I. Operations are extremely variable, ranging from a situation like the Standard/GNM mine which is in a development/production phase from June through Oct. (1-5 individuals working mine), to weekend placer mining with portable suction dredges. Although separately these small "pick and shovel" mining activities may be insignificant in terms of disturbance, cummulatively from drainage to drainage these activities could be having a considerable effect on grizzly habitat use patterns.

Due west of GNM 4.5 air miles over the Cabinet Divide is a large scale mineral exploration program being conducted by American Smelting and Refining Company (ASARCO), and of lesser scale by U.S. Borax. ASARCO's 4-year geologic core drilling program in the Chicago Peak area is to terminate October 1983. Information on plan of operations

and compensation measures identified are described in the Environmental Assessment for Rock Creek Properties, June 17, 1980, and biological evaluations for the Chicago Peak, Rock Peak and Copper Gulch programs (Henry and Christensen 1980, 1981, and 1982).

A proposed 10 year project-activity scenario has been provided by ASARCO for the Rock Creek properties (communications with J. Balla, ASARCO, March 7, 1983), and is summarized below. The timing and degree of development allowed would be approved annually by the USDA Forest Service through Operating plans.

1984 Extension of existing drilling program to better define the limits and grade of strata bound mineral deposits on validated claims. 1984 may be the final year of surface occupancy within wilderness boundaries.

1985-86 Exploratory adit phase; single adit located in upper West Fork of Rock Creek would tunnel in underneath and drift about in the main ore body for necessary mineral samples. Program is expected to occur during summer season and may be designed into or became part of the development phase.

1987-94 Development phase; dependent on existing situation of the economy (eg. price of silver, interest rates). Full development is expected within 5-10 years, with production extending over 15-20 years. Rock Creek mines and mill site development will be located in the West Fork Rock Creek area and is expected to be very similar to ASARCO's Troy Project in plant site layout operations, and size.

C. Recreation and Road Use

Various recreational pursuits along the East Cabinet Face and in the Wilderness are of primary current use on the Forest. The major types of recreation occuring in and around the analysis area include driving for pleasure, dispersed camping, hunting, fishing, hiking-backpacking, berry picking, wood gathering, and snowmobiling. The season in which a particular activity is most prevalent is shown in Table 1, Appendix I.

Primary activities related to foot and horse travel in the Cabinet Wilderness are backpacking, fishing, and hunting. In 1982, the southern portion of the Wilderness on the east side of the divide from Bear Creek south, received 2244 visitor use days by 1524 visitors, which consists of 32 percent of total wilderness use occurring on the Libby Ranger District (Cabinet Mountain Wilderness Report 1982). Major trailheads in fairly close proximity to the proposed development that access high lake basins and received an average of 2 visitors/day or more during the summer months include Bramlet, 4th of July, Lake, Bear, and Baree Creeks. Approximately 85 percent of wilderness use occurs in the months of July, August and September (J. Jeresek 1983 pers. comm.).

Road related recreation occurs primarily in the summer and fall months. Two developed campgrounds, Howard Lake and Lake Creek, are located in the area. Howard Lake and stretches of the Libby Creek tributaries are popular fishing spots for local residents. As mentioned previously, the slopes of GNM are well known locally for the productive huckleberry shrubfields, and are used quite heavily by berry pickers in late summer and early autumn. The same area also provides an exceptional scenic viewing opportunity of the Cabinet Range from several vantage points along main roads. The East Face in general receives the heaviest road use during the big game hunting season in October and November. Snowmobiling is the only primary winter road related activity. Presently there are no specific road closures to snowmobiles, with access permitted up the East Side Cabinet roads to the wilderness boundary.

The current road system from Bear Creek south to West Fisher consists primarily of two main arterial-collector roads, Libby-West Fisher Loop 231 and Bear Creek 278, which connect with numerous local roads. Traffic counts taken on Libby Creek Road 231 a few miles off Highway 2 over a 5 year period (1975-1979) provide a general idea on the amount of traffic influx into the area. The average seasonal daily traffic during this period was 55 vehicles/day without heavy logging traffic and 96 vehicles/day during 2 years of heavy logging (R. Hammons, KNF Engineering, 1983, pers. comm.). It has been estimated that approximately 50 of the 55 vehicles per day are recreation related traffic. Comparable levels of use occur on the Bear Creek Road and West Fisher Road entries also. During the fall months the average daily traffic would be considerably higher than summer due to increased road hunting activity.

D. Range

Two range allotments currently occupy portions of the analysis area. Libby Creek allotment encompasses the riparian zones and adjacent areas along Libby Creek on private and National Forest lands. Thirty cow/calf units are run annually with a turn out date of May 15. The West Fisher range allotment is used by fifteen cattle between June 1 and September 30, with the majority of use concentrating in the riparian bottom of West Fisher (Sections 2,3 and 4) south of the analysis area. There have been no bear/livestock problems reported in either of these established allotments.

E. Residential Use

There are no yearlong residents living in the analysis area. A summer cabin on the private property in Libby Creek and two others in Miller and West Fisher Creeks are occasionally used. The nearest populated area is at the junction of Libby Creek Road 231 and Highway 2 approximately 7 air miles to the northeast of GNM.

V. METHODS OF ASSESSMENT

The following procedures were used in determining the habitat status of the assessment area, identifying past and potential impacts, and in

analyzing the cumulative effects of the proposed development and other land management activities on grizzly bear habitat.

A. Field Data and Associated Information

Field data and relevant information associated with the assessment area was collected, compiled and reviewed. Methods included:

1. The east half of Bear Units 5 and 6 were field surveyed and thoroughly ground mapped of important grizzly habitat components (1981 field season).

2. Forest habitat types were noted during field reconnaissance and were documented generally as to elevation and aspect (Madel, field notes 1981, 1982),(Pfister et al. 1977).

3. Recent grizzly observations and located field sign were compiled, rated, and combined with historical sighting records.

4. Maps and overlays were constructed to visually display the assessment area and proposed project in relationship to seasonal grizzly bear habitat, observation activity centers, existing habitat conditions, and ongoing-proposed land management activities.

B. Consultation and Literature Review

Specific information pertinent to the assessment was collected. Main sources included:

1. Personal communication with USFS Recreation Specialists responsible for ski resort-lands management and other types of recreation in the Northern and Intermountain Rocky Mountain Regions (see Appendix I for list of contacts). Information germane to aspects of the proposed project were compiled.

2. Consultation with research and Forest Biologists to consider available data base, recent research findings and discuss assumptions in the analysis process (see Appendix I for contacts).

3. A literature review was conducted on various aspects of grizzly bear ecology and behavior. EIS and EA reports on regional destination ski areas were also reviewed for information relevant to the assessment.

C. Analysis Procedures

Direct and indirect effects of the proposed ski development on grizzly habitat and seasonal use patterns were spatially and temporarily analyzed in a cumulative fashion using the Cumulative

Effects Analysis Process developed by the KNF (Christensen and Madel 1982). Details of the analysis process are described in the analysis report and will not be repeated here. The general procedures used for this assessment are summarized below.

1. An analysis area was identified, which basically encompassed the east sides of Bear Units 5 and 6, from the main Cabinet Divide to the eastern BU boundaries (See Map 10).

2. The analysis area was then divided into six project elements related to the proposed ski development. These project elements assisted in categorizing and organizing the analysis work, and in identifying key problem areas. Elements include: (See Map 1A)

   - Mountain: The northeast portion of Great Northern Mountain proposed for development of ski runs and facilities.

   - Base: Located at the base of the Mountain, a high density residential area planned to accomodate a majority of the visitor population.

   - Corporate-Private Land: Private land under GNM corporate control

   - Noncorporate-Private Land: Private land under other ownership

   - Access corridor: Main road access to proposed ski development, FS 231.

   - Cumulative Activities Analysis Area:

     Encompassing East Bear Units 5 and 6, the area analyzed for combined potential offsite and onsite activities and their effects.

3. Direct and indirect effects related to the proposed project within the 6 project elements were assessed with the available data base. Area (space) and habitat components that were not freely available to grizzly bears due to project-human associated disturbance factors were determined by the use of seasonal influence zones. Areas within and outside influence zones were spatially quantified by planimetering acreage not freely available in each drainage, and deducting it from the total space(Electronic planimeter with accuracy of ±2%). Seasonal grizzly habitat components were qualitatively and spatially analyzed by computing the changes in available habitat units directly and indirectly influenced by the project.

4. Effects of other present/ongoing land uses were analyzed in the same cumulative manner, and generally included road access, active or sold timber sales, recreation use areas, and major mineral exploration-mining activities.

5. The status for BU 5 and 6 were determined in relation to the spatial and seasonal habitat criteria recognized as necessary in maintaining a minimum viable home range situation. Other potential effects of the proposed project were evaluated verbally and the implications discussed.

VI. PROJECT ANALYSIS

A. Comparative Analysis of Destination Ski Areas

In order to evaluate not only the direct effects of GNM ski development on grizzly habitat but also the more variable indirect effects on bear habitat use, it was necessary to examine characteristics of other ski resorts similar in size and environmental setting. Such a comparison is subjective because no two ski developments are alike in every aspect, and tend to differ diacritically in the distance and access from a metropolis, the range of opportunities and attractions offered, and location to developed versus wilderness areas. However, data collected on analogous ski areas does provide broad correlations between the type of development and expected population and land use changes that may occur in relation to GNM. This comparison is to provide a perspective on activities and development that may apply to GNM ski area, from which assumptions were generated. Appendix I lists reports and correspondence contacts used for this analysis. Table 4, Appendix I, identifies general relevant characteristics of four current and three planned (under construction) ski resorts located in the Rocky Mountain region.

The primary intent of any large ski area is to attract people to the facilities. The operating scenario proposed for GNM typically classifies as a destination/vacation ski resort. Brandenberger (1976) defines a vacation ski resort as a large year-round operation that can offer the range of amenities sought by vacationing skiers. Small or medium size ski areas can provide amenities if in a vicinity with established summer recreation attractions. The feasibility of a ski resort depends as much on its potential for year around recreation as its skiing capacity (Brandenberger 1976). In an economic analysis study, Goeldner and Dicke (1974) summarize average characteristics of resort ski areas that provides comparison data and insight for GNM ski proposal. They reported that over 50 percent of the vacation ski areas in the nation were located in the Rockies, averaging 174,644 skier visits per year per area (in 1974). They tended to be located away from any metropolitan area of 50,000 people or more, with over two-thirds located 100 miles or more away. Vacation ski areas tended to have many beds available at the base and even more within a 10 mile

radius. They further provided more recreational amenities than day ski areas, with over half offering golf, two-thirds offering tennis, three-fourths having swimming, half with ice skating, and over 90 percent offering ski touring. Seventy percent were open during the non-ski months and operating as year-round resorts. A large portion of vacation ski areas were involved in some type of land development (72%), with 69 percent engaged in second home development, and 62 percent in condominium development (Goeldner and Dicke 1974).

A comparison of the actual number of skiers that current ski areas receive in western Montana, northern Idaho, and northeast Washington, with the upper limit 500,000 skier visits/year proposed for GNM, would conservatively position GNM as one of the largest resorts in the Northern Region (USFS). Whether or not the proposed project is realistic economically or in correlation with skier-market demands is beyond the scope of this assessment and is to be presented in a market analysis study (Alpine Consultants Inc. 1983).

The number of summer visitors inhabiting ski resorts correlates with observed increases in offsite recreational activities (A. Silker, 1983 pers. comm.). EIS reports prepared for vacation ski resorts in Table 4, Appendix I, recognize that there will be a significant increase in developed and dispersed types of recreation as a result of a ski development. The estimated average summer occupancy for ski areas similar in size to GNM range between 1,000 and 2,000 inhabitants consisting of overnight visitors and permanent residents. This does not account for single day visitors that may average an additional 1,000 per day (Teton Village, A. Silker, 1983 pers. comm.), or 80,000-116,000 summer visitors annually as projected for Beaver Creek Ski Area (EIS, 1976) and Ski Yellowstone (Mount Hebgen EIS 1977). Major types of offsite recreation reported by ski resorts include pleasure driving and 4-wheel drive tours, horseback riding (guide and outfitters), backpacking in adjacent wilderness or primitive areas, fishing, boating, and interpretive nature walks. Snowmobiling and X-country skiing are the main uses during winter and early spring months. The bulk of summer visitation generally occurs in the months of June, July, and August, with it peaking in mid-July and rapidly dropping off after Labor Day (pers. comm. with A. Silker and G. Morris 1983, Mount Hebgen EIS 1977, projected summer occupancy estimates).

Development of large ski areas typically occurs over a 10-15 year period and are constructed in 3 or 4 phases (J. Korb 1983 pers. comm. Mount Hebgen EIS 1977, Beaver Creek EA 1976). Primary access and inter-village roads tend to be paved with minor roads being oil treated. Service roads accessing ski slopes are regularly used during summer-fall months to maintain chairlifts, groom ski runs, and supply upper day-lodge buildings (Jackson Hole Ski Area Revised Master Plan 1981, C. Michael 1982 pers. comm.). Most existing ski resorts operate a tram or chairlift during the summer (Table 4, Appendix I). An aerial tram at Teton Village receives 80,000-100,000 visitor rides in the summer months annually. Reported impacts caused by providing access to upper lift terminals are that it encourages heavy foot traffic along easily traveled ridges and tends to funnel hikers into high elevation primitive-wilderness environments at a rate exceeding

the area's capacity (Beaver Creek EA 1976, Jackson Hole EA 1980). From this comparative analysis on destination ski resorts, assumptions were made in relation to GNM proposed ski area felt to be relevant in this assessment; these are:

1. The proposed project classifies as a vacation type ski resort with two main visitor seasons, the winter ski season running from late November to mid-April, and the summer non-ski season between June and early September.

2. GNM as proposed would classify as one of the largest destination ski resorts in the Northern Region.

3. The average summer population at GNM in full development would potentially range between 1000-2000 people including additional day visitors.

4. There would be a significant increase in dispersed types of recreation in surrounding National Forest lands during the winter and summer months. Substantial changes in the Recreation Opportunity Spectrum Classes (ROS User's Guide USDA 1981) in and around GNM ski development can be expected to shift from a current Roaded Natural and Semi-Primitive Motorized setting to Rural and Urban environment (G. Hathaway 1983 pers. comm., Rifle Ski EIS 1983, Adam's Rib Draft EIS 1981).

5. Ancillary development and activities can be expected to occur in and around the ski area. These may include a summer chairlift or tram operation; service roads used during non-ski months; mountain ski-trail grooming and maintenance; and offsite group activities (interpretive walks and tours, various schools, etc.). Subdivision and development of adjacent noncorporate private lands can also be expected to occur as a result of the attraction the ski resort would support in the area.

6. Full development of GNM ski area would occur between 10-15 years.

B. Evaluation Techniques and Criteria

The evaluation procedures used in analyzing the potential effects of GNM ski area proposal on the resident grizzly population was a relatively complex integration of information on habitat, bear behavior, known patterns of habitat use, and facts or assumptions on GNM development and related activities. Impacts on grizzlies and grizzly habitat as a consequence of the physical presence of the ski area and private lands development were considered as <u>direct effects</u>. <u>Indirect effects</u> were primarily caused from offsite human disturbance factors originating from the resort base population.

Influenced habitat was assessed as either a fixed loss or variable loss depending on the effects (direct-indirect) and circumstances. Sites of proposed or expected human occupancy and development were recognized as fixed losses and considered as unavailable to grizzlies all seasons of the year. Fixed habitat losses may be seasonal if directly associated with the project and influenced by human activity consistently each year. It is well documented that when people and grizzlies are placed in situations of co-habitation, the innate behavior of both bears and/or humans leads to conflicts in which the bear is removed or destroyed (Martinka 1982, USDI 1981, Jonkel and Servheen 1977). Thus it is unrealistic to assume that grizzlies could co-exist with people in or around the development, even during off-season months. Habitat areas indirectly influenced by increased recreational activities associated with GNM, or sites currently affected by vehicle traffic along roads, timber harvest and mining activities, or heavily used recreation sites were defined as variable losses. These were considered as temporary in nature depending on the season and duration of the disturbance.

In this analysis, spatial loss was identified and quantified by drawing influence zones on maps around the disturbance source. Areas outside influence zones represented undisturbed habitat freely available to grizzlies while habitat within the influence zone of a particular activity was recognized as not being freely available. This is to say, even though influenced habitat is not physically denied to bears, this habitat is less effective because it is not fully utilized (Martinka 1983 pers. comm.). Grizzlies respond to the smells, sounds, and sights of human related activities by avoiding the source of disturbance (USFS 1983). Mace and Jonkel (1980) reported that even a minimum amount of disturbance will displace grizzlies, especially when human activity is sporadic. Because of the individualistic behavior displayed by grizzlies, each bear may respond differently to the same influencing stimuli (McArthur 1979). However, through the analysis process, efforts were concentrated on protecting the important adult female segment of the Cabinet population with the assumption that the welfare of other grizzlies would also be accomodated for (Christensen and Madel 1982). Numerous studies have shown that female grizzlies with cubs select rugged isolated areas removed from human disturbance factors (Pearson 1975, Hamer et al. 1979, Russell et al. 1979, and Zager 1980).

The extent or reach of influence zones were tied directly with research findings on known average avoidance patterns displayed by grizzlies in response to various human related disturbances. From nearly a 1000 grizzly radio locations during a 6 year period along the East Front of the Rockies, Aune and Stivers (1983) reported that the lowest average distance in which grizzlies were located from roads was .75 miles (1.2 km). This figure was documented for the spring months when grizzlies were down in low elevation spring range habitat where road densities were correlatively high. The distance from roads increased as bears moved away from spring concentration areas to upper elevation summer range (K. Aune 1983 pers. comm.). The same authors also found that this distance was less for lightly traveled roads (±10 vehicles/week), and that a significant shift in road avoidance by

grizzlies occurred in a relatively undisturbed area from .38 miles (.6 km) to .58 miles (.93 km) as a result of increased traffic associated with oil and gas field development (K. Aune, 1983 pers. comm., Aune and Stivers 1983).

The avoidance distance of .75 miles reported by Aune and Stivers was modified to 0.5 miles for the analysis to adjust for perceived differences in habitat variables such as topography and vegetative cover that exists between the East Front and the Cabinet Range. An influence zone of 0.5 miles was then identified that paralleled open roads that currently receive moderate to heavy traffic, or were expected to increase in use significantly (2 times or more in average seasonal traffic) as an indirect result of the ski development. Lightly traveled roads were given a narrower zone of influence of .25 miles. This new data has generated a change in the Cumulative Effects Analysis Process for spatially assessing road impacts which were previously based on elk (Cervus elaphis) avoidance behavior, with an influence zone of .25 miles for well traveled roads. The zone of influence has thus been expanded to .5 miles on the basis of grizzly behavior under the premise that this change leads the analysis into a more realistic situation.

Recreational sites and developed foot/horse trails currently receiving heavy human pressure, or those areas with the potential to increase substantially in use during the summer as a result of the proposed project were analyzed as not freely available to grizzlies. Influence zones along trails were identified as 400 feet on either side, considered as the sight distance in which vegetation and/or topography hides 90 percent of a grizzly from human view (Mealey 1977). In most instances, recreational sites outside road influence zones were associated with hiking destination points, these typically being high elevation lake basins. Influence zones in upper basins were variable depending on the amount of recreational visitor days current or expected, basin size, and its topography and cover characteristics. High use areas and/or steep, tight basins were generally analyzed as influenced clear to the boundary ridge tops. Mace and Jonkel (1980), Schallenberger and Jonkel (1980), and J. Craighead (1983 pers. comm.) have reported that human intrusion into a grizzlies environment displace bears, with movements usually occurring out of the drainage in which the disturbance took place and into an adjacent drainage. Such intrusions separately are short term in their effect, yet over the season, heavily recreated basins may be unavailable to bears. Grizzly observation data for the Cabinets tends to reinforce this assumption.

Wild free-ranging grizzlies, unaccustomed to people and their food sources, present the least danger to people (McArthur 1979). Outside national park boundaries, it is dangerous to assume that grizzlies can, will, or should habituate to human disturbances. Gilbert (1977) defines human habituation primarily as a reduction in the bear's flight distance, the distance to which a bear allows a person to approach before it flees. When a grizzly overcomes its reluctance to forage near people, the danger arises that it will attack people who accidentally surprise it at close range or interfere with its feeding

(Craighead and Craighead 1972, Herrero 1976). Such encounters often ultimately result in bears being destroyed or relocated.

Timber sales that were spatially analyzed for this assessment were those occurring in Bear Units 5 and 6 that were either currently active or sold and under contract. Depending on the seasons and duration of a sale, zones of influence were generally extended to the surrounding ridges or most logical topographical features. In many cases, the timber sale was already within the existing road influence zones. The effects of timber harvest and road construction activities on grizzly and brown bears have been well documented in different geographical areas (Elgmork 1978, Nagy and Russell 1978, Blanchard 1979, and Mace and Jonkel 1980).Research efforts by Mace and Jonkel (1980) indicated that grizzlies are prevented from using a drainage in which logging activities are occurring by limiting their movements to the surrounding drainage ridges. Bears may further be displaced up to 2 miles by timber harvest activities (ibid).

C. Project Element Analysis

1. Mountain

The northeast portion of Great Northern Mountain proposed for development (See Maps 1A and 2) ranges in elevation from 4000 feet near the base to its high peak of 6867 feet. The broad east facing slope contains two prominent upper cirque basins that are tributaries of Standard Creek. In general, the lower two-thirds of the mountain is heavily timbered with dense young stands of mixed conifers that resulted from an extensive fire in 1910. Forest habitat types progress from TSHE/CLUN in the drainage bottoms of Howard and Standard Creeks to ABGR/CLUN, ABLA/MEFE, ABLA/XETE, and PIAL/ABLA along the very ridgetops. Open and timbered components along the upper east face of GNM supplies preferred grizzly plant foods during the summer and fall months. Drainage forbfields, wet meadows and graminoid sidehill parks associated with the ridgetops and basins of GNM are important summer components. Furthermore, the easily traveled ridges of GNM and its connection with the Howard Lake saddle provides a potential travel corridor for bears moving across to the Miller Creek drainage. Grizzly tracks located on GNM in spring of 1978 and 1982 that paralleled the north ridge supports this assumption. Zager (1980) reported that grizzlies in the NCDE used ridgetops extensively as travel corridors during the spring and summer, as well as digging for corms/roots in adjacent sidehill parks and slabrock areas. Open and timbered huckleberry shrubfields are abundant along the upper slopes in the ABLA/XETE/VAGL habitat type and are known to be used heavily by black bears during the fall months. Two well developed beargrass sidehill parks occur in each of the cirque basins and are recognized as potential denning sites. All potential denning habitat is located on the upper east and south facing aspects of GNM.

Current activities on the east face of GNM are low and are primarily associated with the upper Standard Creek Road, FS 6745. A small hardrock mining operation of intense activity occurs from June into mid-November in the south cirque basin at 5600 feet (See Map 1D, Appendix II; Table 3, Appendix I). Two other exploratory activities occur intermittently in the same area. Road 6745 is closed to public access, with restricted use permitted for miners. The mid to lower slopes of GNM have been used by people of the Salish-Kootenai Indian tribe for many years to gather huckleberries in the late summer and fall months (C. Howard 1982 pers. comm.), and more recently commercial berry picking has increased in the area.

Map 2 displays the preliminary development plans for the ski hill. Roads constructed on the NE face would service the ski runs and proposed mountain restaurant. Service roads are expected to be used regularly during summer and fall for the repair and maintenance of lift facilities. Summer trail grooming involving removal of rock and brush cutting is a continuous job and very important to allow and insure good skiing conditions from the beginning to the end of the season (Nurse 1981). As discussed earlier, it is likely that a chairlift would operate during the summer, dropping off visitors near the top of the mountain for scenic viewing. Winter activities on GNM would be typical of those occurring at other large ski areas including machine snow grooming, full chairlift operation, and downhill skiing.

Summer influence zones in relation to development, service and recreational activities on the mountain are shown on Maps 4B and 5B. Spring and fall influence zones are similiar to those of summer because of the expected relative consistency from one or more of these disturbance factors. More area is influenced during the winter months due to the intensified human activity on the ski hill. Computed results of the mountain analysis on available space and affected grizzly habitat are displayed in Table 5 below.

TABLE 5. Mountain Element; Affected Space and Habitat.

	SPACE (Acres)		WEIGHTED HABITAT COMPONENT ACRES *		
	Loss	Available	Existing	Loss	Available
Current Summer	118	2623 (4.1 mi^2)	197.3	2.0	195.3
GNM Summer	1451	1290 (2.0 mi^2)	197.3	99.3	98.0
GNM Fall	1451	1290 (2.0 mi^2)	586.6	157.6	429.0
GNM Spring	1451	1290 (2.0 mi^2)	295.0	123.7	171.3
GNM Denning	1873	868 (1.4 mi^2)	476.9	423.4	53.5

* Weighted habitat components are existing habitat component acres multiplied by a quality rating (1-3)(Christenson and Madel 1982)

Development of GNM would be a permanent resource commitment of Forest Service land. The area affected on the east slope as a result of the proposed ski hill and associated activities is a fixed seasonal habitat loss. Patterns of seasonal human presence and activity are expected to be similar or increase each year following initial construction (EIS Mount Hebgen 1977). Major impacts on GNM from the direct and indirect effects of the ski hill as discussed are:

a. Fixed loss of potential denning habitat. Activities occuring on GNM during the pre-denning and denning periods would likely preclude grizzlies from using the area. Approximately 89% of the recognized potential denning habitat lies within the influence zones of the project. Bears are sensitive to disturbances during den preparation and occupancy, and are vulnerable to extreme physiological and behavioral stress if forced from dens during winter sleep periods (USFWS 1980).

b. Fixed loss of fall foraging habitat. Grizzly behavioral data indicate that bears avoid roads and human activity. Disturbances on the ski slope and the close proximity of the ski village significantly decreases the probability that grizzlies will use the existing shrubfield components. With people recreating and/or working on the ski hill, it may also be undesirable to have grizzlies feeding in the vicinity, in order to avoid possible human/bear confrontations.

c. Disruption of a potential seasonal movement corridor. Potential east-west grizzly movements on GNM and across the Howard Lake-Midas Point saddle could be impeded, through bear avoidance of the direct effects associated with the ski hill and village development. Grizzlies tend to travel along ridges or high points, making the Howard Lake saddle a likely corridor for accessing the extensive graminoid sidehill park complex and riparian habitat in Miller Creek during the spring and summer months. In addition, the influences of the proposed project combined with the existing ½ mile influence zone of Forest Service Road 231 could create a situation of habitat fragmentation.

The amount of spring and summer habitat analyzed as being lost to potential grizzly use along GNM's East Face is comparatively minor with the abundance of late spring and summer foraging sites in adjacent drainages.

2. Base

The Base element as displayed on Map 1A is situated at 4000 ft. and encompasses 140 acres of Forest Service land (SW Section 12 and NW Section 13, T27N R31W). The majority of the Base area is densely timbered with a 73 year old stand of mixed conifers in a

TSHE/CHUN h.t. The northern end overlaps with an existing open seedtree unit cut in 1979 (See Orthophoto Map 3). Foraging values of the Base are low, with few or no key bear foods growing under the closed forest canopy. Because of its close proximity to the Howard Lake saddle, its primary importance would be in functioning as a movement corridor as described earlier.

Timber management is the primary current resource use within the identified Base area. Recreational opportunities are limited. Along the east side of the Base, Road 4779 accesses Howard Lake and receives moderate traffic levels during the summer and fall. Intermittent placer mining also occurs next to this road in the summer (See Map 10).

As shown on the GNM Village Concept Map (See Map 2), the Base element contains a high density residential area that includes condominiums, hotels, a shopping mall, day lodges, parking lots, and other development essential to village support. The village complex is to provide 1200 to 1500 beds. From mid-range between the estimated skier visits per year, an average of 3334 average daily skier visits would be expected at the Base. During the non-ski season occupancy would probably be significantly less, with most of the summering population on the adjacent private lands.

The Base area is a fixed spatial loss as a direct result of the development and associated human occupancy. Little or no important seasonal grizzly habitat is effected. Influences from the base development would likely impact the potential movement corridor in combination with activities on the mountain. Aune and Stivers (1983) document that grizzly bears avoided gas well sites from an average of .5 mile. A village setting as proposed is considerably larger than a well site, with many more people in or around the vicinity. Thus, the influence zone would be comparable or farther reaching than that of a well site. The existing road influence zone across the saddle presently effects a portion of this potential travel corridor. Primarily, the Mountain and Base elements will increase the space influenced by human activities and the probability that grizzlies will avoid the site.

3. Corporate Private Land

Private land either owned or under control by GNM Ski Corporation includes approximately 525 acres along the bottom of Libby Creek, in Sections 1, 2, 11, and 12, T27N R31W (See Map 1A). The area ranges in elevation from 3600 to 4200 feet. The majority of private land is outside the upper Libby Creek canyon, where the drainage bottom widens out along the East Face of the Cabinets. Vegetation communities are extremely variable and diverse along this stretch of the creek. Extensive riparian zone consists of open herbaceous forbfields, low elevation wet meadows, riparian

shrubfields, and stands of mixed conifers and cottonwood (Populus trichocarpa). Habitat types along the stream bottom are THPL/CLUN/ARNU, TSHE/CLUN/ARNU, and pockets of THPL/OPHO. Lower slopes are in the drier TSHE/CLUN/CLUN phase. These highly productive low gradient stretches have been created by past and current beaver (Castor canadensis) activity, past selective logging, and fire. Key bear foods are abundant during the spring, early summer, and fall months, including graminoids, Equisetum spp., umbels and other wet-site forbs, and the fruits of Cornus, Lonicera, and Rubus spp. Security cover is high for bedding and traveling in the riparian zones.

The private land along Libby Creek was acquired from the Federal Government through the patenting of mining claims. During the early 1900's, the area was subjected to fairly heavy placer mining activity (Johns 1970). Intermittent placer mining with heavy equipment has occurred on two private land sites near Libby and Howard Creek during the last two summers. Timber harvest has occurred adjacent to private lands, with two large clearcuts bordering to the North which were harvested in 1970 and have responded well with a mixed shrubfield growth. Currently, the main resource use in this private land and intermixed Forest Service block is roaded recreation, such as pleasure driving and hunting primarily by local residents in the summer and fall months. Snowmobiling on the Forest Service Road 231 Loop and to access Howard Lake, occurs during the winter. Libby Creek is relatively undisturbed during the spring months of April and May. By early June, the roads become snowfree and vehicle traffic increases.

The proponents plan to eventually develop the corporate-private lands for residential lots and condominium use. A nordic ski village is proposed along Libby Creek at the mouth of the canyon. Future development sites are shown on the GNM Village Concept Map (See Map 2). The area, in general, would take on the characteristics of a well maintained condominium and summer home development. There have been no projections made on expected seasonal population levels for this private land block.

Area and seasonal grizzly habitat directly influenced by the proposed private land development is displayed on Map 4B. Habitat within a .5 mile zone around the corporate-private land is identified as a fixed spatial loss during all seasons of the year, similar to the Base element analysis. The major impact as a result of the proposed development is a permanent loss of spring habitat that is currently available to grizzlies at this time, particularly in the early and mid spring periods. Habitat component acres affected are quantified in the following matrix (Figure 3).

FIGURE 3. Corporate-Private Land; Affected Habitat.

AFFECTED HABITAT COMPONENTS	COMPONENT ACRES	WEIGHTED HABITAT COMPONENT ACRES			
		SPRING	SUMMER	FALL	DENNING
Riparian Streambottom	58.2	174.6	0	58.2	0
Low Elevation Wet Meadow	32.5	97.5	0	32.5	0
Graminoid Sidehill Park	43.3	86.6	43.3	0	0
Mixed Shrubfield/Snowchute	37.2	111.6	74.3	74.3	0
Mixed Shrubfield/Cutting Unit	224.0	0	0	448.0	0
Total Habitat Loss	395.2	470.3	117.6	613.0	0

In relation to the entire east side of Bear Unit 5, spring range components outside the upper canyons are the few habitat sites phenologically available to bears in late April and May, which puts an added importance on riparian and marsh zones along the East Face (Madel 1982). Riparian habitat directly influenced by corporate-private land development is approximately 42 percent of all recognized spring habitat east of the upper canyons in Bear Unit 5. A considerable amount of fall components also become a fixed habitat loss in Libby Creek, but are presently indirectly effected through road disturbance (variable loss).

4. Noncorporate Private Land

Private land along Libby Creek to the north of Corporate Land is parcelled up among various owners, the largest holder being Libby Placer Mining Company. The entire tract contains around 925 acres ranging in elevation between 3300 and 4200 feet. (See Map 1A). Forest types and habitat components are similar to that described for the corporate lands. A one mile stretch of Libby Creek centered in the Noncorporate property increases in gradient and winds through a narrow canyon which separates the upper depositional stream reach (Sec. 1, T27N, R31W) from a lower stretch containing 85 acres of riparian habitat (SW¼ Sec. 30, NW¼ Sec. 31, T28N, R30W). The majority of the timbered habitat has been selectively logged ±30 years ago and has resulted in a fairly dense shrub and regenerating conifer understory. The low gradient riparian zones are important spring foraging components with high cover values for feeding movements and daybed use. Under current use patterns this spring habitat is available normally until early June when roads become snowfree.

Two other seperate tracts of Noncorporate-Private lands occur in the upper Libby Creek Canyon in Section 15. The larger (±77 acre) parcel borders the south side of Libby Creek in the riparian zone, and is heavily timbered in TSHE/CLUN and ABLA/CLUN/MEFE h.t. above. A ±17 acre tract on the north side of Libby Creek road overlaps open mixed shrubfield/snowchute and timbered habitat.

Currently, the two primary land uses are roaded recreation and livestock grazing. Because of the surrounding high road densities, most of the Noncorporate land lies within road influence zones in the summer and fall. The other land tracts in the upper canyon receive very low human use and are influenced in summer and autumn by light vehicle traffic along the road.

As with existing destination ski areas and major vacationing sites, the effects of improved access, overnight lodging, and opportunities for onsite and offsite recreational activities eventually contribute to significant increases in the market value of conterminous lands. (J. Kursher 1983 pers. comm., A. Silker 1983 pers. comm., J. Korb 1983 pers. comm., Beaver Creek EA 1976, Adam's Rib Draft EIS 1981). Subdivision and development are a result of these factors, and is usually oriented toward second-home and condominium interests, including potential support facilities to the resort population. Thus, in relation to the proposed ski resort and corporate land development, other adjacent private lands are assumed to eventually be developed as an outward expansion of the resort community.

A fixed loss of all spring habitat within Noncorporate Private Lands would be the primary impact as a result of the direct effects of development and human occupancy (See Map 4B). Habitat adjacent to these lands would also be permanently influenced. This is in contrast to the current situation where Noncorporate private lands are seasonally available to bears. The matrix below (Figure 4) displays the acres and the quality of spring foraging habitat directly influenced. Riparian habitat (stream bottom and marsh) that would be effected by development of Noncorporate private lands outside the upper Libby Creek Canyon accounts for 41 percent of the total in Bear Unit 5 along the East Face.

FIGURE 4. Noncorporate Private Lands; Affected Habitat

AFFECTED HABITAT COMPONENTS	SPRING HABITAT COMPONENT ACRES	WEIGHTED HABITAT COMPONENT ACRES
Outside Canyon:		
Riparian Streambottom	85.2	255.6
Marsh	5.0	5.0
Dry Meadow	166.2	166.2
Subtotal Habitat Loss	256.4	426.8
Inside Canyon:		
Graminoid Sidehill Park	71.1	142.2
Riparian Streambottom	6.3	18.9
Snowchute	1.1	3.3
Mixed Shrubfield/Snowchute	43.3	129.9
Subtotal Habitat Loss	121.8	294.3
Combined Habitat Loss	378.2	~~551.0~~ 721.

Summer -

5. Access Corridor

The existing Forest Service Road 231 is proposed to function as the main access route to GNM Ski area. The road winds along the south side of the lower Libby Creek Canyon until reaching the Noncorporate private land along the East Face where the road crosses over to the north side of the creek. The lower canyon is steep and heavily timbered with few open habitat components occurring in the area before it contacts the populated Libby Valley (See Map 1A). In May of 1976, a large adult grizzly was observed crossing the main Libby Creek road in the lower canyon(Sec. 17, T28N, R30W, See Observation Map). It's believed that the south facing parks on Big Hoodoo Mtn above the canyon may provide bears with early emerging grasses and occasional winter-killed carrion. Most of this area is outside the boundaries of Bear Unit 5 and was not spatially analyzed in either the current or proposed situations.

The Forest Service 231 road receives relatively heavy vehicle traffic during the summer and fall months (71.6 ave. seasonal daily traffic, 1975-1979), which consists primarily of recreational and logging traffic (R. Hammons 1983 pers. comm.). The lower stretch of Libby Creek canyon is popular for its good fishing by local residents. Snowmobiling is a regular use during the winter

An upgrading of the Libby Creek Road 231 is expected, in order to handle the increase in traffic volumes during the winter and summer seasons. The proponents have not provided any plans for upgrading of Road 231.

Road improvement would possibly include alignment and improved surfacing through oil treatment or paving of the road. Direct effects of increased traffic volumes and road improvement in the lower Libby Creek canyon would be minimal on grizzly habitat. A potential exists that it may influence habitat use on the southerly aspects of Hoodoo Mountain or disrupt potential movements across Libby Creek to the Horse Mountain ridge complex.

6. Cumulative Activities Analysis Area

The east halves of Bear Units 5 and 6 from the main Cabinet Divide comprises the area analyzed for potential indirect effects from the proposed project (See Map 1A). General landscape characteristics are described under Proposed Project, Location (p. 1). Refer to the section on Grizzly Bear Habitat for description of the vegetative characteristics of the immediate area around GNM, and see the Base Habitat Component Maps 4 and 5 for complete seasonal habitat display. The Analysis Area currently has a diversity of grizzly bear seasonal habitat. Compilation sheets summarized for Bear Creek south to Trail Creek identify the quantity and quality of habitat components and constituent elements existing on the ground for each subdrainage (Appendix I). The seasonal values for each drainage can be weighed with others by comparing the total habitat units available per season. For example, Bear Creek has abundant high quality spring and summer habitat but is relatively low to moderate in fall and denning habitat. When all five of the east drainages in BU 5 are compared, it is shown that Libby Creek is by far the most important in meeting the year long habitat requirements of the grizzly. Poorman Creek, although one of the smaller drainages is exceptionally high in quality acres of denning and fall components. Of the 5 subdrainages in the east side of BU 6, the upper West Fisher Canyon and GNM far exceed (by 2x) others in the amount and quality of seasonal habitat, and is computed as the most productive yearlong subdrainage in all of East BU 6 and 5. The West Fisher-GNM area is also considerably higher in existing denning habitat than any other subdrainage. Grizzly bear observation and sign locations tend to correlate surprisingly well with seasonal habitat unit levels. This suggests that grizzlies in the Cabinets are selecting the more diverse and seasonally productive drainages in which to concentrate their foraging activities.

Land uses in the Cumulative Activities Analysis Area are discussed under the Current Activities Situation section. The main land uses are timber harvest, recreation, and mining. Influence zones in relation to the current activities during the summer season are displayed on Maps 4A and 5A. Influence zones were most extended during the summer when activity levels were highest, and thus were more significant in comparing changes between existing levels of disturbances and the expected levels as a result of the proposed project. Under the current summer situation, most arterial and connector roads receiving moderate to heavy traffic were analyzed with a .5 mile influence zone. Local roads that receive light vehicle traffic had a narrower influence zone (.25 miles). Many other activities fell inside the existing road influence zones and were not considered as additional losses. Large timber sales, such as Trail Creek, resulted in an expansion of existing road influence zones to the ridgetops. Heavily used recreation sites also had variable influence zones, depending on the type of terrain and use.

Direct and indirect effects of the proposed ski development were analyzed for each season (spring, summer, fall, denning). Expected increases in dispersed recreational activities as a result of the ski area were assessed as described earlier, and zones of influence were modified from the current situation (See Map 4B and 5B). Changes in the amount of space and component acres available were computed and are shown in Tables 6,7,8 and 9 (Appendix I). In general, local roads, trails, and recreation sites analyzed as increasing significantly in the amount of human related use from or as a result of the ski village development, have expanded influence zones. These changes are analyzed on the full development scenario projected by the proponents, and thus are not expected to be immediate, but to increase over an extended period of time . Other future planned or proposed projects within BU 5 or 6 such as timber sales, road construction, or mining activities (ASARCO, Borax, etc.) were not spatially analyzed, but space affected by each project individually are included in Table 10 and Figure 2 (Appendix I).

Results of the spatial analysis in the Cumulative Activities Area (within which includes project elements 1-4) show that an additional 9% (6.4 mi^2) of currently secure grizzly habitat in BU 5 and 10% (6.9 mi^2) in BU 6 becomes unavailable as consequence of the proposed project. The primary effects of this spatial loss combined with other activity disturbances are that both Bear Units drop significantly below the lower threshold determined necessary for a viable home range (70 mi^2). After the termination of the Trail Creek Timber Sale and the Miller Creek portion of the Horse-Cable Timber Sale in 1989, the amount of undisturbed space in BU 6 increases to 69.3 mi^2. Although the space required would bring BU 6 close to threshold, a majority of the area influenced by these two timber sales is low in seasonal foraging habitat (See Table 9 and Compilation Sheets, Appendix I), and only partially alleviates unavailable habitat components affected by the project. There are no timber sales influencing total space in BU 5 after 1984 (E. Fork Bull Timber

Sale terminates in 1983 or 1984), so that 63.3 mi^2 with GNM ski development is a relatively fixed number, without major compensation efforts. Currently BU 5 is at threshold without either ASARCO's or Borax's exploratory activities in the wilderness spatially analyzed, with which would presently put BU 5 at 58.0 mi^2 using the half mile road influence zones. ASARCO has communicated that 1984 will likely be their last season of exploration within the Cabinet Wilderness (J. Balla 1983 pers. comm.).

With the development and occupancy of a population center in an area such as GNM that was previously unoccupied, it can be expected that bear/human confrontations would increase, particularly through contact in the wilderness as a result of more people entering undisturbed areas that grizzlies frequent. As more people/bear interactions occur over time, the potential for human-induced mortality also rises through removal or illegal kills (Martinka 1982).

Alterations in the ratio of habitat constituent elements due to the effects of the proposed project are relatively significant during particular seasons (Table 7 and 9, Appendix I). Major shifts in available summer habitat components in east BU 6 (81% to 55%) were indirectly tied to increased recreational activities from GNM. With more people entering the wilderness area on foot or horseback during the summer months, certain high lake basins would probably become less secure habitat and/or be avoided by grizzlies. Fall habitat is impacted in much the same way (61% available). Of major concern are the fixed losses of early to mid spring habitat in east BU 5 and 6. Approximately 84% of the early to mid spring riparian habitat in east BU 5 becomes permanently unavailable to bears as a result of Corporate and Noncorporate lands development. Over ninety percent of the riparian habitat outside the upper canyons in east BU 6 is presently indirectly influenced by open roads, which are expected to increase substantially in use during the spring by GNM village residents and locals visiting the site.

It should be noted that the availability of computed seasonal habitat units are somewhat overestimated, especially in regards to the upper canyons where aspect and elevation strongly influence plant community phenology, as noted by Henry and Christensen (1982). An important example of this is in spring range, where mixed shrubfield/snowchutes compose well over half of the total spring habitat irrespective of site characteristics. Although lower portions of south-facing snowchutes are usually available for foraging in mid to late spring (late May and June), north-facing chutes and upper elevation southerly sites may not green up until late June or early July (Madel 1982 Field Notes). Thus, under normal conditions, habitat actually available to grizzlies in the spring months consists mostly of low elevation riparian zones, south-facing graminoid sidehill parks, and lower portions of south-facing snowchutes.

VII. SUMMARY AND CONCLUSIONS

A. Overall Affects

The combined direct and indirect effects of the proposed project as a whole have the potential for impacting the Cabinet grizzly population in the following ways;

1. By reducing the amount of secure-undisturbed space below that which is deemed necessary for grizzlies to meet their normal nutritional and behavioral needs.

2. By displacing bears from important seasonal habitat components during critical use periods. Displacement may result from indirect human associated disturbances or in the related disruption of movement corridors accessing important seasonal habitat.

3. The permanent and/or physical loss of seasonal habitat that may be critical for an individual bear's survival.

4. The increased possibilities of grizzly/human interactions, and the resulting potential for human-induced mortalities.

The cummulative effects of other ongoing and proposed land uses in addition to those of the ski development would further adversely affect grizzlies by further decreasing freely available space. In many cases, disturbances associated with these traditional activities (eg., timber harvest, prospecting, hunting) are temporary, lasting a few seasons or years, while the proposed project is expected to be a permanent year-around disturbance, fluctuating in intensity by visitor seasons.

The major effects listed are each relatively significant in their potential for impacting the Cabinet grizzly population. In both reducing the amount of undisturbed space and available seasonal habitat required by grizzlies, individual bears may be stressed nutritionally and behaviorally. This may be particularly detrimental during sensitive portions of the year when preferred feeding sites are limited, such as during the early spring when there are few or no alternative sites. Following den emergence in April and May, grizzlies may weigh 25-40 percent less than the previous fall depending on their age and reproductive condition (Kingsley et al. 1980, Sizemore 1980). Grizzlies require undisturbed foraging areas during this time simply to maintain their nutritional state. As a result of the proposed ski development and associated direct effects, undisturbed early spring feeding sites would be significantly reduced on the east sides of BU 5 and 6. Late fall periods are also important because bears need to achieve substantial fat reserves for winter survival and successful reproduction by females (USDI 1982). The vicinity on and around GNM has been identified as both an important food concentration site during the fall months, and as having high quality denning habitat. A large portion of the mountain would become unavailable during these periods due to onsite activities. The potential exists that grizzlies traditionally using GNM in the autumn

or for denning may be displaced or abandon a den site. Grizzlies are known to be sensitive to disturbance during the pre-denning period and have been reported to abandon dens due to human associated activities elsewhere (Craighead and Craighead 1972, Quimby 1974, Reynolds et al. 1983).

The current status of the Cabinet Mountain grizzly population is felt to be precarious by leading authorities (USDI 1982). With the suspected low population level reported for the Cabinets (Erickson 1978, Jonkel 1979), even the loss of one bear would be detrimental to the population as a whole. Sidorowicz and Gilbert (1981) have shown through modeling analysis for the Yukon that adult grizzly mortality above five percent of the adult population per year will cause a population decline. Assuming that 60 percent of the Cabinet population are adults and an upper population estimate of 20 bears is realistic, then an average loss of more than 0.6 grizzlies per year will create a decline in an already seriously low population.

The ability of the Cabinet and Purcell Mountains to provide secure habitat for grizzlies has been reduced due to past and present human related activities. It is felt that the combined impacts of displacement, permanent loss of seasonal habitat, and increased potential for human-induced mortality as a result of implementation of the proposed project would have an adverse effect on the Cabinet Mountains grizzly population.

B. Compensation Measures

Compensation measures and recommendations have been formulated in an effort to minimize or counteract potential adverse effects of the proposed project on the grizzly. These measures were separately analyzed for their effectiveness in providing space, isolation, and seasonal habitat components back into Bear Units 5 and 6. Most of the compensation opportunities identified were road closures within the analysis area. These are computed in Tables 6, 7, 8 and 9 (Appendix I), showing the changes as they relate to the subdrainages in which they occur, and their effect on the total BU.

Summarized below are the road closures analyzed and the positive additions each has on BU 5 and 6 during the summer months. Spatial and quality changes for the spring and fall months are less significant and are in Tables 6, 7, 8 and 9 (Appendix I).

TABLE 11. Compensation Measures, and Resulting Spatial and Habitat Changes in BU 5 and BU 6.

	SUBDRAINAGE NAME AND COMPENSATION MEASURES	ADDITIONAL SPACE MI^2 SUMMER	ADDITIONAL WEIGHTED HABITAT COMPONENT ACRES SUMMER
BU 5	Bear Creek		
	1. Bear Creek Rd 4783 closed summer	1.9	737.6
	Total BU 5 change:		
	with compensation	65.1	6794.1 (92%) available
	without compensation	63.2	6055.9 (82%) available
BU 6	Mill-W Fisher-Standard		
	2. Upper W Fisher Rd 6746	1.5	812.1
	Miller Creek		
	3. Miller Cr. Rd 4724 close connection after 1988	2.0	54.2
	Bramlet Lake		
	4. Bramlet Cr. Rd 2332	0.5	66.7
	5. Lake Cr. Rd 6748	0.5	(combined)
	W Fisher- Teeter's Peak		
	6. Teeter's Ridge Spurs 4782	0.4	0.0
	7. Teeter's Peak Rd 6743	1.3	(combined)
	Total BU 6 Change:		
	With compensation	75.6 (1989)	4322.9 (85%) available
	Without compensation (1989)	69.3	3383.2 (66%) available
	(thru 1988)	59.9	2787.1 (55%) available

A number of other compensation measures, within the discretionary authority of the Forest Service, that would reduce the indirect impacts of the project were also considered as potential opportunities but were not spacially analyzed. These compensatory measures will be evaluated and weighed environmentally, economically, and socially for their effects on resource use in an Environmental Impact Statement for the ski area if it is determined that some or all could compensate for this proposed project. These are as follows:

1. A complete year long road closure plan for the east side of Bear Unit 5 north of the proposed project location.

2. Closing the Libby Creek-West Fisher Road 231 Loop at the Howard Lake saddle.

3. Closing the Miller Creek Road 4724 at Highway 2.

4. Develop a Cabinet Mountain Wilderness User-Permit System in order to limit and manage human activities within the wilderness.

The compensatory measures listed would partially alleviate the negative effects of the project by gaining back space and isolation in BU 6 and possibly BU 5 above the threshold limit. Additional summer and fall foraging habitat would also be available, bringing the ratio of seasonal habitat close to what is presently available during these seasons. The application of a user-permit system for the Cabinet Wilderness may assist also in reducing potential human/bear confrontations. However, even if all of these measures are implemented, the direct loss of critical seasonal habitat (spring and denning) related to the GNM ski proposal, and the increased probability of human induced mortality in conjunction with increased numbers of people in the area raises the question as to whether identified compensation is adequate. Determining whether the magnitude is sufficient to jeopardize the continued existence of the Cabinet Mountain grizzly population is a legal responsibility of the U.S. Fish and Wildlife Service (Endangered Species Act as amended, 1978).

C. Recommendations

The following recommendations are provided to minimize the direct onsite adverse effects of the proposed ski hill, base, and private lands development. These are meant to function primarily in lessening the probability of grizzly/human encounters, and thus reducing the potential for human-induced mortalities.

1. The entire GNM ski slope should be closed to public access during the spring, summer, and fall months. The operation of a chairlift or tram during these seasons should be prohibited.

2. Restrict or control concurrent mining activities on GNM during the spring, summer, and fall months. This would lessen the degree of impact on the mountain by preserving potential grizzly use of upper elevation habitat components, particularly in the autumn.

3. Bear-proof and odor-proof garbage containers should be used throughout the ski area-resort community complex. Sanitation of the grounds should be a continual service with daily garbage collection and disposal.

4. Do not allow helicopter tours of the GNM area or helicopter skiing associated with the project development. Aircraft access to the site should be within a designated flight corridor.

5. Regular programs would need to be conducted to educate the visiting and permanent segments of the resort population on grizzly/human problems, and bear behavior and ecology.

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APPENDIX I

TABLE 1 Current and Potential Recreational Activities in the Analysis Area.

	ROADED RECREATION	BACKCOUNTRY WILDERNESS	SEASON OF USE				CURRENT USE	POTENTIAL USE
			SP	SU	F	W		
1. Pleasure and destination driving	x		x	*	x		x	
2. Off-road use	x			x	*		x	
3. Camping (developed)	x			*	x		x	
4. Hunting	x	x	x		*		x	
5. Fishing	x	x		*	x		x	
6. Berry picking	x			x	*		x	
7. Firewood gathering	x			x	*		x	
8. Boating	x			*	x		x	
9. Hiking and walking	x	x	x	*	x		x	
10. Backpacking		x	x	*	x		x	
11. Horseback riding	x	x		*	x		x	x
12. Outfitter-guide operations	x	x		x	*			x
13. Mountain Climbing(technical)		x		*				x
14. Cross country skiing	x	x	x			*	x	
15. Helicopter alpine skiing		x	x			*		x
16. Snowmobiling	x	x				*	x	

* Major season of use

x Minor season of use

Table 2 Timber Sale Activities in and adjacent to the Analysis Area; East Bear Units 5 and 6.

	TIMBER SALE NAME	VOLUME (MMBF)	STATUS	SEASON AND DURATION	LOCATION (WATERSHEDS)
1.	Granite Creek	9	Proposed 1984	Summer-Fall-Winter Active until 1989	Snow, No, Deep, Smearl, Leigh Snowshoe, Big Cherry, Granite
2.	Horse-Cable	23	Sold 1982	Summer-Fall-Winter Active until 1988	Bear, Cable, Poorman, Ramsey, Libby, Little Cherry, Miller
3.	Trail Creek	6	BNI 1982 USFS Proposed 1983	All Seasons Active until 1986	Trail (West Fisher)
4.	Swamp-Schrieber	4	Proposed 1987	All Seasons Active until 1990	Swamp, Schrieber
5.	Hoodoo	18	Sold 1979	All Seasons Active until 1985	Crazyman, Getner, Hoodoo (Libby)
6.	Midas	4	Proposed 1988	Summer-Fall-Winter Active until 1992	Midas (Libby)
7.	No	0.3	Proposed 1983	Summer-Fall-Winter Active until 1984	Granite, Snow, No, Deep
8.	Poker Hill	1	Proposed 1983	All Seasons Active until 1984	Hoodoo

TABLE 3 MINING ACTIVITY WITHIN AND ADJACENT TO ASSESSMENT AREA

	OPERATOR	LOCATION	TYPE-STAGE	ACTIVITY LEVEL	DURATION	COMMENTS
1.	Whitson	Bear Cr. Head	Hard Rock-Exploration	Intermittent	July 1-September 30	Vehicle Access, Explosives
2.	Sloan	Ramsey Cr. Head Bear Cr. Head	Hard Rock-Exploration	Intermittent	July 1-September 30	Vehicle Access, Explosives
3.	Abrahamson	Cable Cr. Head	Hard Rock-Exploration Development	Moderate	July 1-September 30	Vehicle Access, Large Group, Explosives
4.	Cripe	Poorman Cr. Head	Hard Rock-Exploration	Intermittent	July 1-September 30	Vehicle Access, Explosives
5.	Rosencrans	Libby Cr. Head	Hard Rock-Exploration	Intermittent	June 1-October 30	Explosives
6.	Babb	Libby Cr. Head	Hard Rock-Exploration Placer-Production	Moderate	June 1-October 25	Explosives
7.	Vickery	Goat Cr.-Libby Cr. Head	Hard Rock-Exploration Development	Intense	July 1-October 25	Large Group, Site Occupancy Vehicle Access, Explosives, Heavy Equipment
8.	Pival	Howard Cr.	Placer-Development Production	Intermittent	June 1-October 25	Vehicle Access, Large Group
9.	Barton	Great Northern	Hard Rock-Exploration	Moderate	July 1-October 25	Vehicle Access, Explosives
10.	Nethercott	Great Northern	Hard Rock-Development Production	Intense	June 1-November 15	Large Group, Vehicle Access, Site Occupancy, Heavy Equipment, Explosives
11.	Shaw	Great Northern	Hard Rock-Exploration	Moderate	July 1-October 25	Vehicle Access, Explosives
12.	Bakie	W. Fisher Head Great Northern	Hard Rock-Exploration	Intermittent	June 1-October 25	Vehicle Access, Explosives
13.	Claypool	W. Fisher-Upper	Placer-Production Hard Rock-Development	Moderate	June 1-September 15	Large Group, Vehicle Access, Site Occupancy
14.	Lastofka	W. Fisher-Head	Hard Rock-Exploration Development	Intermittent	June 1-October 25	Vehicle Access Explosives
15.	Dodson	Mill Cr., 4th July, Bramlet	Hard Rock-Exploration	Intermittent	June 1-October 25	Vehicle Access, Explosives
16.	Moe	Miller Cr.-Head	Hard Rock-Development	Intermittent	June 1-September 30	Heavy Equipment
17.	Keith	Lost Girl-Head	Hard Rock-Exploration	Intermittent	July 1-August 31	Vehicle Access, Explosives
18.	Heidelberg Mining Co.	Rock Cr.-Head	Hard Rock-Production	Moderate	July 1-September 30	Vehicle Access, Site Occupancy, Heavy Equipment, Explosives
19.	Anaconda	E. Cabinets	Hard Rock-Exploration	Intense	July 1-August 31	Helicopter Supported

Table 4 Comparative Ski Area Characteristics.

SKI AREA	STATUS	VACATION 2 SEASON SKI RESORT	SKIER VISITS PER YEAR	SKIER-AT-ONE-TIME CAPACITY	ESTIMATED AVERAGE SUMMER POPULATION	APRES-SKI ACTIVITIES AVAILABLE (ONSITE)	SUMMER TRAM OR CHAIRLIFT OPERATED	SIGNIFICANT OFFSITE RECREATIONAL ACTIVITIES REPORTED	ADJACENT TO WILDERNESS OR PRIMITIVE AREA
Big Mountain MT	Current	No	250,000	4,000	200	No	Yes	No	No
Big Sky MT	Current	Yes	120,000	3000-4000	400-500	Yes	Yes	No	Yes
Mount Hebgen MT	Proposed	Yes	Not Estimated	6,500	1776	Proposed	Unknown	Yes-Assumed	No
Great Northern MT	Proposed	Yes	250,000-500,000	4000-6000	Unknown	Proposed	Unknown	Unknown	Yes
Jackson Hole WY	Current	Yes	240,000	4,000	1500-2000	Yes	Yes	Yes	Yes
Beaver Creek CO	Current	Yes	Unknown	3500-7500	Unknown	Yes	Yes	Yes	Yes
Rifle CO	Proposed	Yes	Not Estimated	5,000	1000-2000	Proposed	Unknown	Yes-Assumed	Yes
Adam's Rib CO	Proposed	Yes	Not Estimated	9,000	2300	Proposed	Unknown	Yes-Assumed	Yes

TABLE 6 EAST BEAR UNIT 5 SPATIAL ANALYSIS

SUBDRAINAGE NAME	CURRENT SITUATION SUMMER	GNM PROJECT SITUATION SUMMER	GNM PROJECT SITUATION SUMMER (w/compensation)	GNM PROJECT SITUATION FALL	GNM PROJECT SITUATION FALL (w/compensation)	GNM PROJECT SITUATION SPRING	GNM PROJECT SITUATION SPRING (w/compensation)
1. Bear Creek							
unavailable space	2522 acres	3330	2108	1810	--	1288	--
available space	2948 acres	2140	3362	3660	--	4182	--
2. Cable Creek							
unavailable space	2140 acres	2443	--	2140	--	1816	--
available space	2250 acres	1947	--	2250	--	2574	--
3. Poorman Creek							
unavailable space	2388 acres	2793	--	2418	--	2110	--
available space	2522 acres	2117	--	2492	--	2800	--
4. Ramsey Creek							
unavailable space	725 acres	1213	--	997	--	725	--
available space	3725 acres	3237	--	3453	--	3725	--
5. Libby Creek							
unavailable space	3934 acres	5997	--	5753	--	5753	--
available space	5611 acres	3548	--	3792	--	3792	--
Total Space Unavailable	11709 acres	15776	14554	13118	--	11692	--
Total Space Available	17056 acres	12989	14211	15647	--	17073	--
Total Space Available							
E BU 5 mi^2	26.6 mi^2	20.3	22.2	24.4	no change	26.7	no change
W BU 5 mi^2	43.0 mi^2	41.3	41.3	not analyzed	--	not analyzed	--
Total BU 5	69.6 mi^2	61.6	63.5				
After 1986 (E. Fork Bull River T.S.)		63.2	65.1				

TABLE 7 EAST BEAR UNIT 5 SEASONAL HABITAT ANALYSIS (Weighted Habitat Component Acres, W.H.C.)

SUBDRAINAGE NAME	CURRENT SITUATION SUMMER	GNM PROJECT SITUATION SUMMER	GNM PROJECT SITUATION SUMMER (w/compensation)	GNM PROJECT SITUATION FALL	GNM PROJECT SITUATION SPRING
1. Bear Creek					
Unavailable weighted habitat component acres	349.1	762.8	24.6	18.5	57.5
Available	1799.6	1385.9	2123.5	1276.0	1985.8
2. Cable Creek					
Unavailable w.h.c. acres	6.8	26.8		123.8	10.1
Available	1505.9	1485.9		1073.0	1794.9
3. Poorman Creek					
Unavailable w.h.c. acres	7.0	52.7		0	19.4
Available	1134.3	1088.6		1104.3	1596.9
4. Ramsey Creek					
Unavailable w.h.c. acres	0	31.2		147.8	0
Available	296.3	265.1		452.3	436.1
5. Libby Creek					
Unavailable w.h.c. acres	189.0	436.3		740.1	984.7
Available	2077.7	1830.4		1662.5	2864.2
Total Weighted Habitat Component Acres Unavailable	551.9 (8%)	1309.8 (18%)	571.6 (8%)	1030.2 (16%)	1078.1 (11%)
Total W.H.C. Acres Available	6813.8 (92%)	6055.9 (82%)	6794.1 (92%)	5568.1 (84%)	8677.9 (89%)

TABLE 8 EAST BEAR UNIT 6 SPATIAL ANALYSIS

SUBDRAINAGE NAME	CURRENT SITUATION SUMMER	GNM PROJECT SITUATION SUMMER			GNM PROJECT SITUATION FALL			GNM PROJECT SITUATION SPRING	
		thru '88	1989	Compensation 1989	thru '88	1989	Compensation 1989		Compensation
Mill-W Fisher-Standard	2392	4104	--	3143	3595	--	2895	2527	2312
	6683	4971	--	5932	5480	--	6180	6548	6763
Miller Creek	4193	7610	5501	4193	7610	4193	4193	4193	--
	3417	0	2109	3417	0	3417	3417	3417	--
Bramlet Lake	1586	2779	--	2985	1302	--	638	538	--
	3679	2486	--	3180	3963	--	4627	4727	--
W. Fisher-Teeter's	6434	6742	5690	4583	6646	5594	4487	4244	--
	2826	2508	3570	4677	2614	3666	4773	5016	--
Trail Creek	3204	3185	389	389	3185	389	--	107	--
	1846	1865	4661	4661	1865	4661	--	4943	--
Total acres E BU 6 lost	17809	24420	18373	14393	22338	15073	15398	11609	11394
Total acres E BU 6 available	18451	11840	17877	21867	13922	21187	20862	24651	24866
E BU 6 total mi^2 available	28.8	18.5	27.9	34.2	21.8	33.1	32.6	38.6	38.9
W BU 6 total mi^2 available	41.4	41.4	41.4	41.4					
Total available BU 6 mi^2	70.2	59.9	69.3	75.6					

TABLE 9 EAST BEAR UNIT 6 SEASONAL HABITAT ANALYSIS (Weighted Habitat Component Acres, W.H.C.)

SUBDRAINAGE NAME	CURRENT SITUATION SUMMER	GNM PROJECT SITUATION SUMMER thru '88	SUMMER 1989	SUMMER Compensation 1989	GNM PROJECT SITUATION FALL thru '88	FALL 1989	FALL Compensation 1989	GNM PROJECT SITUATION SPRING Compensation	
1. Mill- W Fisher- Standard									
Unavailable weighted habitat component acres	329.5	1026.7		214.5	856.8		531.4	140.0	
Available	2118.6	1421.4		2233.5	2184.1		2509.5	3813.8	
2. Miller Creek									
Unavailable w.h.c.	176.8	795.2	230.8	176.6	310.1	79.6		169.2	
Available	618.4	0	564.4	618.6	0	231.3		1254.0	
3. Bramlet Lake									
Unavailable w.h.c.	358.2	357.3		290.6	294.5		231.1	74.1	
Available	792.0	792.9		859.6	1480.1		1543.5	1514.8	
4. W Fisher-Teeter's Pk									
Unavailable w.h.c.	105.0	120.9	89.2	87.0	1286.9		454.7	972.1	
Available	303.8	287.9	319.6	317.4	314.1		1147.2	682.0	
5. Trail Cr.									
Unavailable w.h.c.	4.2	6.4		2.0	40.5			49.5	
Available	287.1	284.9		280.5	409.0			317.9	
Total Weighted Habitat Component Acres Unavailable	973.7(19%)	2306.5(.45)	1710.4(.34)	770.7(.15)	2788.8(.39)	2558.3(.36)	1336.5(.19)	1704.9(.24)	none
Total w.h.c. acres available	4119.9(81%)	2787.1(.55)	3383.2(.66)	4322.9(.85)	4387.3(.61)	4617.5(.64)	5839.3(.81)	7582.5(.76)	

Table 10 Spatial Analysis Summary for BU 5 and 6.

	EBU5	WBU5	Total BU5	EBU6	WBU6	Total BU6
Current Summer Situation	26.6	43.0	69.6	28.8	41.4	70.2
GNM Summer Situation	20.3	43.0	63.3			
Horse Cable T.S. ($3.3mi^2$)						
Trail Creek T.S. ($6.0mi^2$)				18.5	41.4	59.9
After 1988 both T.S. terminate				27.9	41.4	69.3
GNM Spring Situation	26.7			38.6		
GNM Fall Situation	24.4			21.8		
Direct Effects of GNM	2.9			0.2		
Indirect Effects of GNM	2.5			6.7		
Total Effects of GNM (unavailable)	6.4			6.9		
Additional Spatial Loss						
ASARCO/Borax exploratory activities - Rock Pk		11.6				
ASARCO - Direct Effect of potential development WF Rock Cr.		1.2				

FIGURE 1 Temporal Timber Sale Activities in and adjacent to the Analysis Area; East Bear Units 5 and 6.

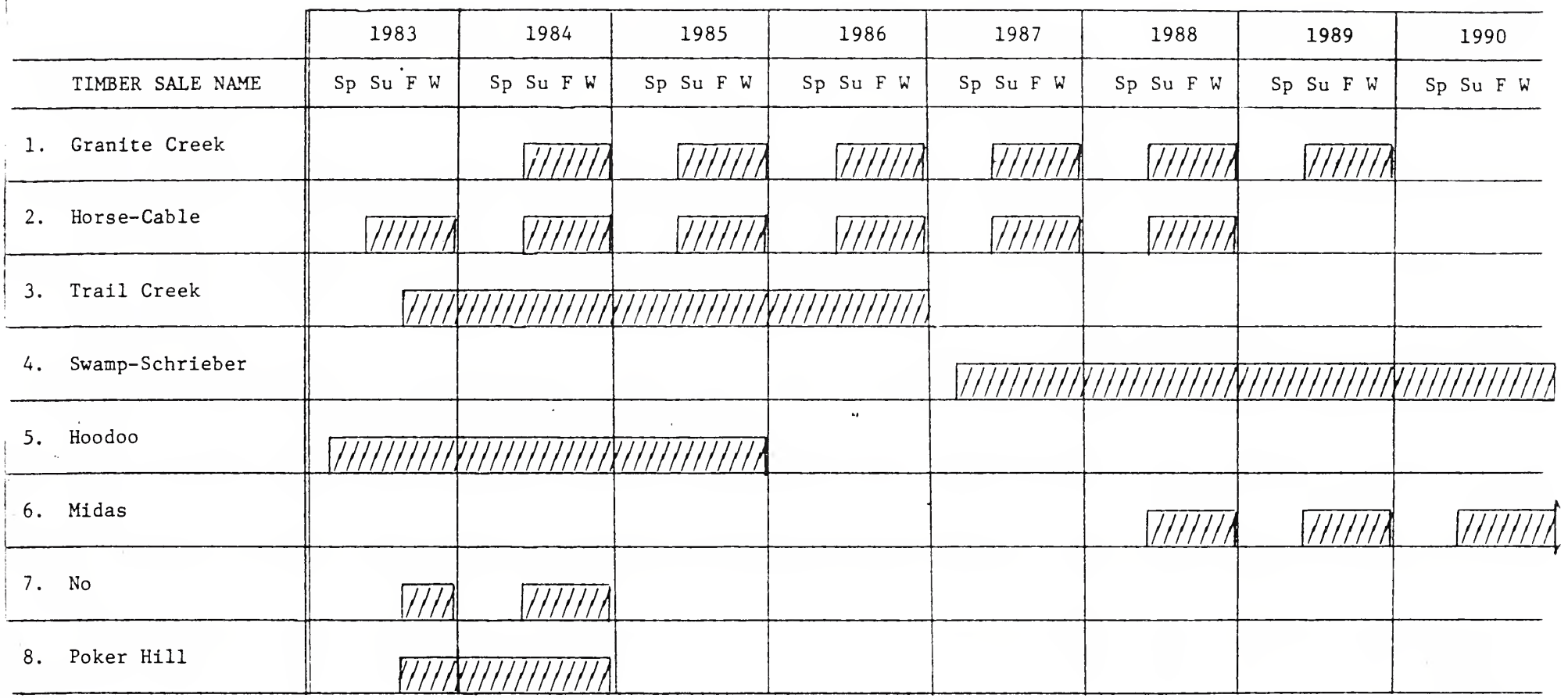
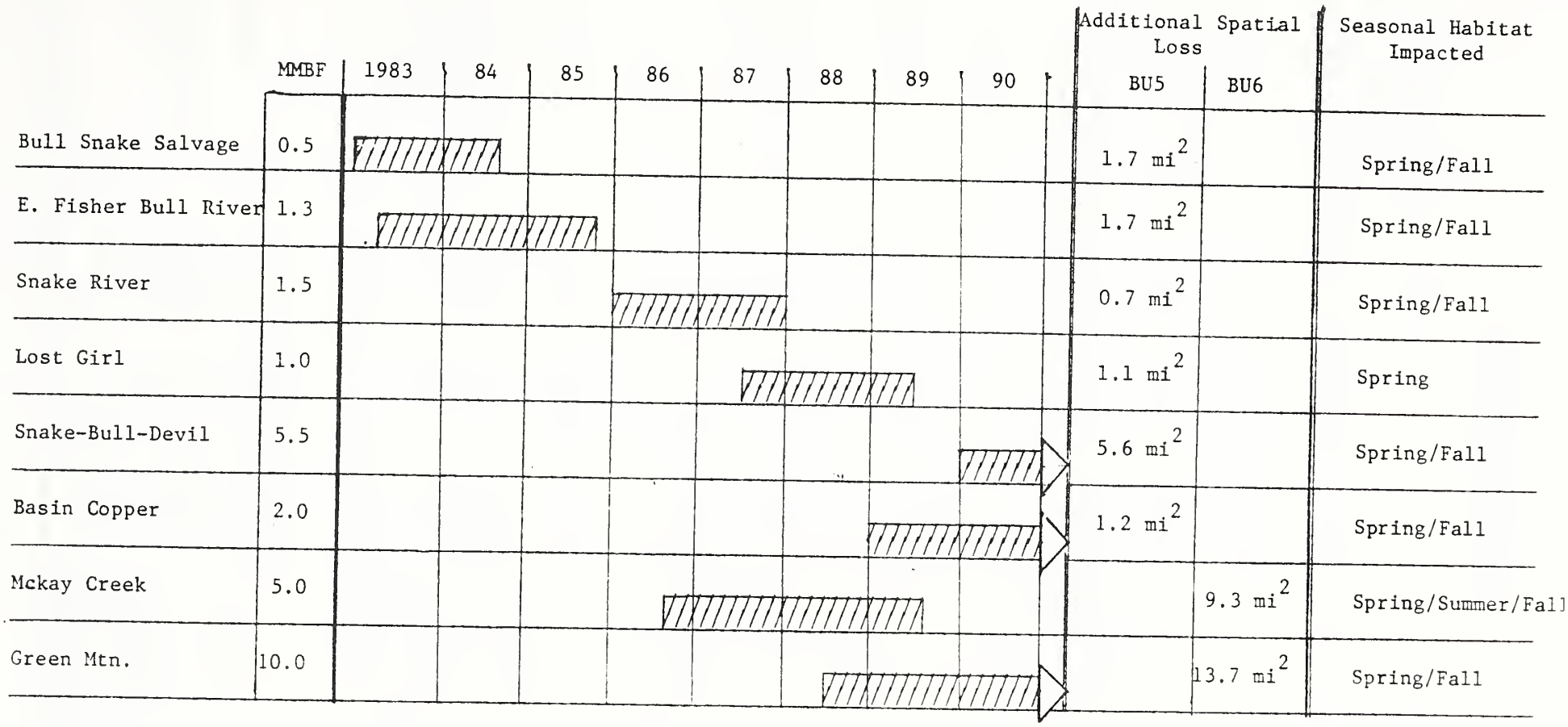


FIGURE 2 Timber Sale Activities in West Bear Units 5 and 6.



COMPILATION SHEET

Subdrainage Bear Creek 110-08 Ref. Maps 3,4

Total Acres 5470 BU-5

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	82.1	3	246.3
Marsh	7.4	1	7.4
Graminoid Sidehill Park	168.7	2	337.4
Mixed Shrubfield/Snowchute	481.8	3	1445.4
Snowchute	4.4	3	13.2
Total	744.4	Total	2049.7

Quality Index = Weighted / Net = 2.753

Component Index = 5

Spring Habitat Units 10,247

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	6.0	2	12.0
Drainage Meadow	181.0	3	543
Snowchute	4.4	3	13.2
Graminoid Sidehill Park	168.7	1	168.7
Mixed Shrubfield/Snowchute	481.8	2	963.6
Alder Shrubfield	149.4	3	448.2
Total	991.3	Total	2148.7

Quality Index = Weighted / Net = 2.167

Component Index = 6

Summer Habitat Units 12889

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	—	3	
Timber/Vacc Shrubfield	124.4	2	248.8
Mixed Shrubfield/Snowchute	481.8	2	963.6
Mixed Shrubfield/Cutting Unit	—	2	
Mixed Shrubfield/Burn	—	3	
L/H Gradient Stream Bottom	82.1	1	82.1
Total	688.3	Total	1294.5

Quality Index = Weighted / Net = 1.880

Component Index = 3

Fall Habitat Units 3882

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	107.4	3	322.2
Timber/Vacc Shrubfield	124.4	1	124.4
Vacc Shrubfield	—	1	
Total	231.8	Total	446.6

Quality Index = Weighted / Net = 1.926

Component Index = 2

Denning Habitat Units 893

Total 27911

COMPILATION SHEET

Subdrainage Cobble Creek 110-08

Total Acres 4390

Ref. Maps 4, 3

B4-5

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	2.4	3	7.2
Marsh	2.9	1	2.9
Graminoid Sidehill Park	90.9	2	181.8
Mixed Shrubfield/Snowchute	537.7	3	1613.1
Snowchute	—	3	—
Total	633.9	Total	1805

Quality Index = Weighted / Net = 2.847

Component Index = 4

Spring Habitat Units 7219

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	4.9	2	9.8
Drainage Meadow	53.2	3	159.6
Snowchute	—	3	—
Graminoid Sidehill Park	90.9	1	90.9
Mixed Shrubfield/Snowchute	537.7	2	1075.4
Alder Shrubfield	59	3	177
Total	745.7	Total	1512.7

Quality Index = Weighted / Net = 2.028

Component Index = 5

Summer Habitat Units 7561

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	—	3	—
Timber/Vacc Shrubfield	—	2	—
Mixed Shrubfield/Snowchute	537.7	2	1075.4
Mixed Shrubfield/Cutting Unit	59.5	2	119
Mixed Shrubfield/Burn	—	3	—
L/H Gradient Stream Bottom	2.4	1	2.4
Total	599.6	Total	1196.8

Quality Index = Weighted / Net = 1.995

Component Index = 3

Fall Habitat Units 3589

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	72.6	3	217.8
Timber/Vacc Shrubfield	—	1	—
Vacc Shrubfield	—	1	—
Total	72.6	Total	217.8

Quality Index = Weighted / Net = 3

Component Index = 1

Denning Habitat Units 218

Total 18587

COMPILATION SHEET

Subdrainage Poorman 110-09 Ref. Maps 4, 5

Total Acres 4910 Bu-5

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	5.2	3	15.6
Marsh	—	1	
Graminoid Sidehill Park	219.1	2	438.2
Mixed Shrubfield/Snowchute	384.7	3	1154.1
Snowchute	2.8	3	8.4
Total	611.8	Total	1616.3

Quality Index = Weighted / Net = 2.641

Component Index = 4

Spring Habitat Units 6463

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	24.5	2	49
Drainage Meadow	31.8	3	954
Snowchute	2.8	3	8.4
Graminoid Sidehill Park	219.1	1	219.1
Mixed Shrubfield/Snowchute	384.7	2	769.4
Alder Shrubfield	—	3	
Total	662.9	Total	1141.3

Quality Index = Weighted / Net = 1.721

Component Index = 5

Summer Habitat Units 5704

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	50.3	3	150.9
Timber/Vacc Shrubfield	50.1	2	100.2
Mixed Shrubfield/Snowchute	384.7	2	769.4
Mixed Shrubfield/Cutting Unit	39.3	2	78.6
Mixed Shrubfield/Burn	—	3	
L/H Gradient Stream Bottom	5.2	1	5.2
Total	529.6	Total	1104.3

Quality Index = Weighted / Net = 2.085

Component Index = 5

Fall Habitat Units 5521

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	160.3	3	480.9
Timber/Vacc Shrubfield	50.1	1	50.1
Vacc Shrubfield	50.3	1	50.3
Total	260.7	Total	581.3

Quality Index = Weighted / Net = 2.229

Component Index = 3

Denning Habitat Units 1743

Total 19431

COMPILATION SHEET

Subdrainage Libby Creek 10-09 Ref. Maps 4, 5

Total Acres 9545 Bu-5

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	173.4	3	520.2
Marsh	11.5	1	11.5
Graminoid Sidehill Park	293	2	586
Mixed Shrubfield/Snowchute	905.7	3	2717.1
Snowchute	4.7	3	14.1
Total	1388.3	Total	3848.9

Quality Index = Weighted / Net = 2.772

Component Index = 5

Spring Habitat Units 19241

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	46.8	2	93.6
Drainage Meadow	14.4	3	43.2
Snowchute	4.7	3	14.1
Graminoid Sidehill Park	293	1	293
Mixed Shrubfield/Snowchute	905.7	2	1811.4
Alder Shrubfield	3.8	3	11.4
Total	1268.4	Total	2266.7

Quality Index = Weighted / Net = 1.787

Component Index = 6

Summer Habitat Units 13600

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	3.6	3	10.8
Timber/Vacc Shrubfield	80.9	2	161.8
Mixed Shrubfield/Snowchute	905.7	2	1811.4
Mixed Shrubfield/Cutting Unit	122.6	2	245.2
Mixed Shrubfield/Burn	—	3	
L/H Gradient Stream Bottom	173.4	1	173.4
Total	1286.2	Total	2402.6

Quality Index = Weighted / Net = 1.867

Component Index = 5

Fall Habitat Units 12007

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	120	3	360
Timber/Vacc Shrubfield	80.9	1	80.9
Vacc Shrubfield	3.6	1	3.6
Total	204.5	Total	444.5

Quality Index = Weighted / Net = 2.173

Component Index = 3

Denning Habitat Units 1333

Total 46181

FIGURE 1

COMPILATION SHEET

Subdrainage Mill-West Fisher-Standard **Ref. Maps** 5,6

Total Acres 9075

Bear Unit 6

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	88	3	264
Marsh	11.3	1	11.9
Graminoid Sidehill Park	379.6	2	759.2
Mixed Shrubfield/Snowchute	970.7	3	2910
Snowchute	3.1	3	9.3
Total	1452.7	Total	3953.8

Quality Index = Weighted / Net = 2.721

Component Index = 5

Spring Habitat Units 19764

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	49	2	98
Drainage Meadow	6.6	3	19.8
Snowchute	3.1	3	9.3
Graminoid Sidehill Park	379.6	1	379.6
Mixed Shrubfield/Snowchute	970.7	2	1941.4
Alder Shrubfield	—	3	—
Total	1409	Total	2448.1

Quality Index = Weighted / Net = 1.737

Component Index = 5

Summer Habitat Units 12237

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	81.7	3	245.1
Timber/Vacc Shrubfield	383.2	2	766.4
Mixed Shrubfield/Snowchute	970.7	2	1941.4
Mixed Shrubfield/Cutting Unit	—	2	—
Mixed Shrubfield/Burn	—	3	—
L/H Gradient Stream Bottom	88	1	88
Total	1523.6	Total	3040.9

Quality Index = Weighted / Net = 1.995

Component Index = 4

Fall Habitat Units 12158

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	293	3	879
Timber/Vacc Shrubfield	383.2	1	383.2
Vacc Shrubfield	81.7	1	81.7
Total	757.9	Total	1343.9

Quality Index = Weighted / Net = 1.773

Component Index = 3

Denning Habitat Units 4031

COMPILATION SHEET

Subdrainage 218-01 Miller

Total Acres 7610

Ref. Maps 5, 6

BU-6

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	60.8	3	182.4
Marsh	—	1	—
Graminoid Sidehill Park	770.4	2	1540.8
Mixed Shrubfield/Snowchute	—	3	—
Snowchute	—	3	—
Total	831.2	Total	1723.2

Quality Index = Weighted / Net = 2.073

Component Index = 2

Spring Habitat Units 3446

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	12.4	2	24.8
Drainage Meadow	—	3	—
Snowchute	—	3	—
Graminoid Sidehill Park	770.4	1	770.4
Mixed Shrubfield/Snowchute	—	2	—
Alder Shrubfield	—	3	—
Total	782.8	Total	795.2

Quality Index = Weighted / Net = 1.015

Component Index = 2

Summer Habitat Units 1589

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	—	3	—
Timber/Vacc Shrubfield	—	3	—
Mixed Shrubfield/Snowchute	—	2	—
Mixed Shrubfield/Cutting Unit	—	2	—
Mixed Shrubfield/Burn	83.1	3	249.3
L/H Gradient Stream Bottom	60.8	1	60.8
Total	143.9	Total	310.1

Quality Index = Weighted / Net = 2.154

Component Index = 2

Fall Habitat Units 620

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	—	3	—
Timber/Vacc Shrubfield	—	1	—
Vacc Shrubfield	—	1	—
Total	—	Total	—

Quality Index = Weighted / Net = —

Component Index = —

Denning Habitat Units —

T- 5655

COMPILATION SHEET

Subdrainage 218-01 Bramlett-Lake

Ref. Maps 5

Total Acres 5265

BU-6

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	45.1	3	135.3
Marsh	—	1	—
Graminoid Sidehill Park	59.3	2	118.6
Mixed Shrubfield/Snowchute	441.7	3	1325.1
Snowchute	3.3	3	9.9
Total	549.4	Total	1588.9

Quality Index = Weighted / Net = 2.892

Component Index = 4

Spring Habitat Units 6355

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	42.4	2	84.8
Drainage Meadow	37.6	3	112.8
Snowchute	3.3	3	9.9
Graminoid Sidehill Park	59.3	1	59.3
Mixed Shrubfield/Snowchute	441.7	2	883.4
Alder Shrubfield	—	3	—
Total	584.3	Total	1150.2

Quality Index = Weighted / Net = 1.968

Component Index = 5

Summer Habitat Units 5749

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	90.7	3	272.1
Timber/Vacc Shrubfield	287.0	2	574
Mixed Shrubfield/Snowchute	441.7	2	883.4
Mixed Shrubfield/Cutting Unit	—	2	—
Mixed Shrubfield/Burn	—	3	—
L/H Gradient Stream Bottom	45.1	1	45.1
Total	864.5	Total	1774.6

Quality Index = Weighted / Net = 2.052

Component Index = 4

Fall Habitat Units 7096

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	195.2	3	585.6
Timber/Vacc Shrubfield	287.0	1	287
Vacc Shrubfield	90.7	1	90.7
Total	572.9	Total	963.3

Quality Index = Weighted / Net = 1.681

Component Index = 3

Denning Habitat Units 2889

T+ 22089

COMPILATION SHEET

Subdrainage 218-01 W. Fisher-Teeter's Park

Ref. Maps 5

Total Acres 9260

B4-6

SPRING

Components	Acres	Quality Rating	Weighted Acres
L/H Gradient Stream Bottom	282.9	3	848.7
Marsh	—	1	—
Graminoid Sidehill Park	395.8	2	791.6
Mixed Shrubfield/Snowchute	4.6	3	13.8
Snowchute	—	3	—
Total	683.3	Total	1654.1

Quality Index = Weighted / Net = 2.420

Component Index = 3

Spring Habitat Units 4961

SUMMER

Components	Acres	Quality Rating	Weighted Acres
Wet Meadow	1.9	2	3.8
Drainage Meadow	—	3	—
Snowchute	—	3	—
Graminoid Sidehill Park	395.8	1	395.8
Mixed Shrubfield/Snowchute	4.6	2	9.2
Alder Shrubfield	—	3	—
Total	402.3	Total	408.8

Quality Index = Weighted / Net = 1.016

Component Index = 3

Summer Habitat Units 1226

FALL

Components	Acres	Quality Rating	Weighted Acres
Vacc Shrubfield	—	3	—
Timber/Vacc Shrubfield	149.2	2	298
Mixed Shrubfield/Snowchute	4.6	2	9.2
Mixed Shrubfield/Cutting Unit	442.4	2	884.8
Mixed Shrubfield/Burn	41.9	3	125.7
L/H Gradient Stream Bottom	282.9	1	282.9
Total	921.0	Total	1601

Quality Index = Weighted / Net = 1.738

Component Index = 5

Fall Habitat Units 8003

DENNING

Components	Acres	Quality Rating	Weighted Acres
Xete Sidehill Park	—	3	—
Timber/Vacc Shrubfield	149.2	1	149.2
Vacc Shrubfield	—	1	—
Total	149.2	Total	149.2

Quality Index = Weighted / Net = 1

Component Index = 1

Denning Habitat Units 149

T-14339

D. Personal Communications and Consultation Contacts

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